reg_AIC_multInteraction

April 27, 2024

[1]:
```
# Kristina Fauss
# April 19, 2024
# model selection by AIC testing all 1st order interactions

import warnings
warnings.filterwarnings("ignore")

import pandas as pd
import statsmodels.formula.api as smf

from ols_mixedef_custom import *
```

[2]:
```
fp = '/Users/kristinafauss/BackupToBox/Git/lab-flammability-testing-2022/data/
 ↪processed-data/main_dataset.csv'

flamog = pd.read_csv(fp)

# drop na's for flam metrics
print(len(flamog))
for col in ['fh', 'fd', 'pfg', 'temp_change', 'heat_flux_change']:
    flamog.dropna(subset=col, inplace=True)
print(len(flamog))

flamog['plant_id']=[str(a)+'_'+str(b) for a,b in zip(flamog['plant'],␣
 ↪flamog['species'])]

# report
print(flamog.columns)
flamog.head()
```

```
172
171
Index(['Unnamed: 0', 'species', 'plant', 'date', 'total_branch_mass',
       'total_leaf_mass', 'stem_mass_ratio', 'leaf_mass_ratio', 'leaf_lfm',
       'thickness', 'leaf_wet_mass', 'leaf_dry_mass', 'stem_lfm', 'stem_width',
       'stem_wet_mass', 'stem_dry_mass', 'stem_sav', 'lfm', 'leaf_dmc',
       'stem_dmc', 'dmc', 'leaf_area', 'leaf_sav', 'LMA', 'SLA', 'rep',
       'branch_length', 'branch_width', 'branch_height', 'sample_wt',
```

```
       'no_branches', 'mpa', 'notes_on_plant_char', 'start_time',
       'ambient_temp', 'ambient_humidity', 'pre_ignition_glow',
       'first_glow_time', 'ignition', 'primary_ignition',
       'primary_time_of_flame_end', 'secondary_ignition',
       'secondary_time_of_flame_end', 'third_ignition',
       'third_time_of_ignition_flame_end', 'time_fh', 'fh', 'time_of_glow_end',
       'end_time', 'thermocoupler_height', 'hotplate_height',
       'notes_on_flam_data', 'fd', 'tti', 'pfg', 'max_temp',
       'time_at_max_temp', 'max_temp_sensor', 'start_temp',
       'start_temp_sensor', 'stable_avg_temp', 'temp_change', 'avg_temp_ch3',
       'max_heat_flux_loessCH7', 'time_at_max_heat_flux_loessCH7',
       'max_heat_flux_loessCH8', 'time_at_max_heat_flux_loessCH8',
       'avg_heat_flux_stableCH7', 'avg_heat_flux_stableCH8',
       'heat_flux_change', 'prop_ig', 'wet_mass', 'dry_mass', 'gdw_gfw',
       'dw_flam_sample', 'ww_flam_sample', 'branch_volume', 'branching',
       'sample_density', 'dw_sppdev', 'plant_id'],
      dtype='object')
```

[2]:

	Unnamed: 0	species	plant	date	total_branch_mass	total_leaf_mass	\
0	1	ARCDEN	1	2022-08-10	20.347	19.505	
1	2	ARCDEN	1	2022-08-10	20.347	19.505	
2	3	ARCDEN	1	2022-08-10	20.347	19.505	
3	4	ARCDEN	1	2022-08-10	20.347	19.505	
4	5	ARCDEN	1	2022-08-10	20.347	19.505	

	stem_mass_ratio	leaf_mass_ratio	leaf_lfm	thickness	…	wet_mass	\
0	0.510564	0.489436	251.06912	0.514	…	1.151	
1	0.510564	0.489436	251.06912	0.514	…	1.151	
2	0.510564	0.489436	251.06912	0.514	…	1.151	
3	0.510564	0.489436	251.06912	0.514	…	1.151	
4	0.510564	0.489436	251.06912	0.514	…	1.151	

	dry_mass	gdw_gfw	dw_flam_sample	ww_flam_sample	branch_volume	\
0	0.3683	0.242414	1.291195	4.035205	1082.04	
1	0.3683	0.242414	1.429372	4.467028	1370.20	
2	0.3683	0.242414	1.283923	4.012477	682.04	
3	0.3683	0.242414	1.283923	4.012477	1262.25	
4	0.3683	0.242414	0.811215	2.535185	819.00	

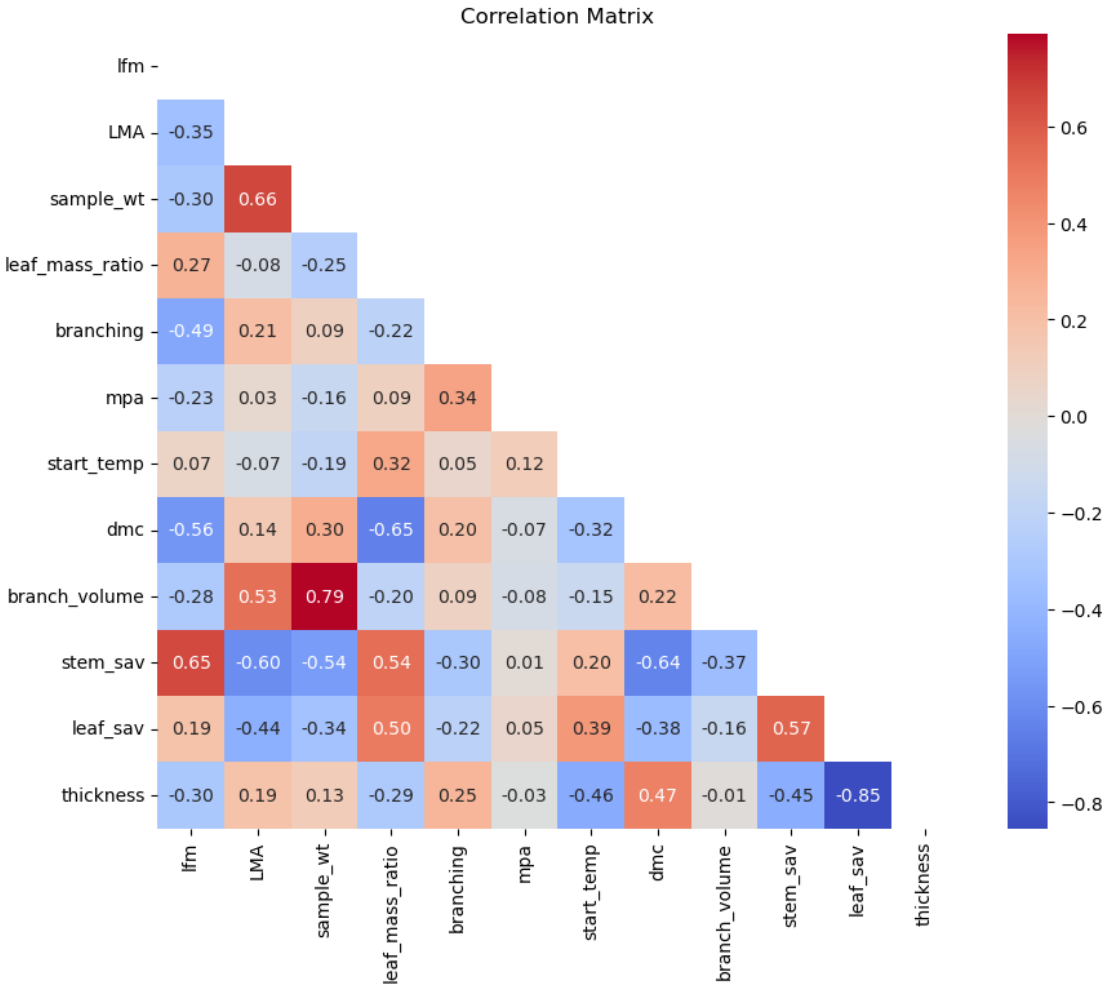
	branching	sample_density	dw_sppdev	plant_id
0	0.416667	0.004923	0.923122	1_ARCDEN
1	0.322581	0.004303	1.348152	1_ARCDEN
2	0.294118	0.007766	0.900752	1_ARCDEN
3	0.466667	0.004196	0.900752	1_ARCDEN
4	0.500000	0.004086	-0.553297	1_ARCDEN

[5 rows x 81 columns]

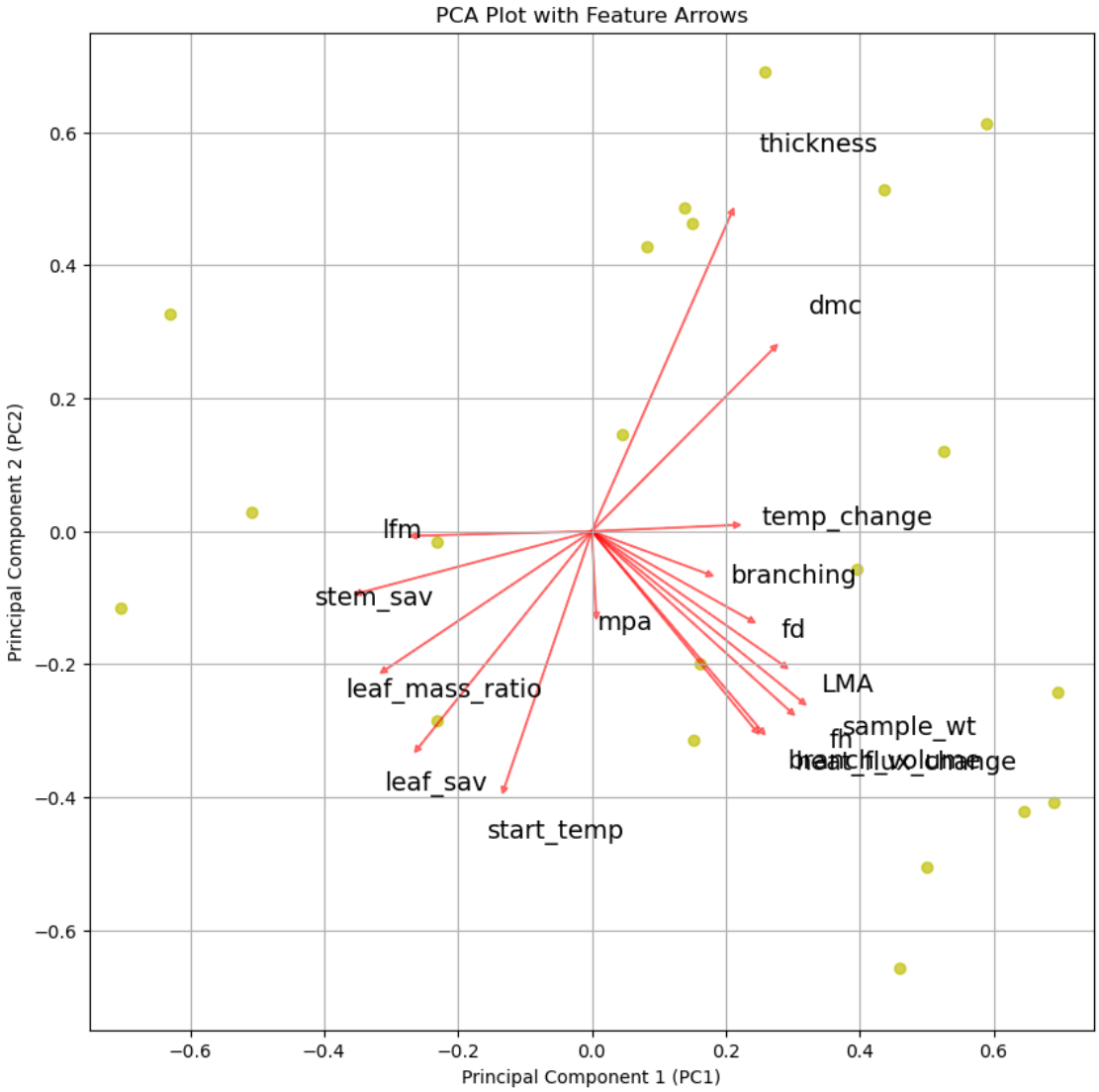
1 Examine Correlation & Structure in Num. Var's

[3]:
```
cols_num_use = ['lfm', 'LMA', 'sample_wt', 'leaf_mass_ratio', 'branching',␣
↪'mpa', 'start_temp', 'dmc', 'branch_volume', 'stem_sav', 'leaf_sav',␣
↪'thickness']

corrplot(flamog, cols_num_use)
```



[4]:
```
PCAplot(flamog, cols_num_use+['fh','fd','temp_change','heat_flux_change'])
```



2 Modeling Preprocessing

[5]:
```
# scale and center
cols_all = ['fh', 'fd', 'temp_change', 'heat_flux_change'] + cols_num_use
flam = scale_and_center(flamog, cols_all, cols_no_change=['plant_id',␣
 ↪'species', 'ignition'])

# declare as factors
flam['species'] = pd.Categorical(flam['species'])
flam['plant_id'] = pd.Categorical(flam['plant_id'])
flam['ignition'] = pd.Categorical(flam['ignition'])
```

```
# drop na's
print(len(flam))
cols_all_dpna = cols_all + ['plant_id', 'species', 'ignition']
flam.dropna(subset=cols_all_dpna, inplace=True)
print(len(flam))

# declare all possible IV cols to model
cols_use = cols_num_use + ['species']
print(cols_use)
```

```
167
162
['lfm', 'LMA', 'sample_wt', 'leaf_mass_ratio', 'branching', 'mpa', 'start_temp',
'dmc', 'branch_volume', 'stem_sav', 'leaf_sav', 'thickness', 'species']
```

3 Run Model Selector

3.0.1 NOTE: Random effect is simply `plant_id`

- NO nested effects
- NO 'species'

It was not possible to test all combinations. Therefore, only combinations of significnt interaction terms and all singletons will be tested.

[6]:
```
mxs = 4 #5
mns = 1
mxi = 2 #5
mni = 1
```

4 Flame Height

[7]:
```
AIC_iterator(flam, cols_use, Y_VAR='fh',
             minnumsingle=mns, maxnumsingle=mxs, minnumint=mni, maxnumint=mxi)
```

```
ERROR: Formula model error: fh ~ leaf_sav*thickness

Columns present in sig. interaction terms: {'sample_wt', 'branch_volume',
'branching', 'thickness', 'leaf_sav', 'LMA', 'lfm', 'start_temp', 'mpa',
'leaf_mass_ratio', 'dmc', 'species'}

Total Num. Cols : Num. Sig. Int. Cols;  13 : 12

Significant Interactions:
('lfm', 'dmc')
('lfm', 'branch_volume')
('lfm', 'leaf_sav')
```

```
('lfm', 'thickness')
('LMA', 'dmc')
('LMA', 'species')
('sample_wt', 'species')
('leaf_mass_ratio', 'dmc')
('leaf_mass_ratio', 'leaf_sav')
('leaf_mass_ratio', 'thickness')
('branching', 'dmc')
('branching', 'leaf_sav')
('branching', 'thickness')
('branching', 'species')
('mpa', 'branch_volume')
('mpa', 'species')
('start_temp', 'dmc')
('start_temp', 'species')
('dmc', 'branch_volume')
('dmc', 'leaf_sav')
('dmc', 'thickness')
('leaf_sav', 'species')
('thickness', 'species')

Number of formulas: 89394
ERROR: Formula model error: fh ~ LMA*species + start_temp
ERROR: Formula model error: fh ~ LMA*species + lfm + sample_wt + branching
ERROR: Formula model error: fh ~ LMA*species + lfm + leaf_mass_ratio + thickness
ERROR: Formula model error: fh ~ LMA*species + lfm + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + sample_wt + leaf_mass_ratio +
branch_volume
ERROR: Formula model error: fh ~ LMA*species + sample_wt + leaf_mass_ratio +
leaf_sav
ERROR: Formula model error: fh ~ LMA*species + sample_wt + mpa + thickness
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio + mpa +
branch_volume
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio + mpa + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio + dmc + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + branching + branch_volume +
leaf_sav
ERROR: Formula model error: fh ~ LMA*species + start_temp + dmc + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + dmc + leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + lfm + sample_wt + stem_sav +
leaf_sav
ERROR: Formula model error: fh ~ LMA*species + lfm + leaf_mass_ratio + mpa +
thickness
ERROR: Formula model error: fh ~ LMA*species + lfm + leaf_mass_ratio + dmc +
branch_volume
ERROR: Formula model error: fh ~ LMA*species + lfm + leaf_mass_ratio +
branch_volume + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + lfm + start_temp + stem_sav +
```

```
leaf_sav
ERROR: Formula model error: fh ~ LMA*species + lfm + dmc + branch_volume +
thickness
ERROR: Formula model error: fh ~ LMA*species + sample_wt + leaf_mass_ratio +
leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + sample_wt + branching + mpa +
leaf_sav
ERROR: Formula model error: fh ~ LMA*species + sample_wt + mpa + dmc + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + sample_wt + start_temp +
branch_volume + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + mpa + dmc + branch_volume +
leaf_sav
ERROR: Formula model error: fh ~ LMA*species + start_temp + dmc + leaf_sav +
thickness
ERROR: Formula model error: fh ~ LMA*species + start_temp + branch_volume +
leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*species + LMA
ERROR: Formula model error: fh ~ branching*species + start_temp
ERROR: Formula model error: fh ~ branching*species + dmc
ERROR: Formula model error: fh ~ branching*species + stem_sav
ERROR: Formula model error: fh ~ branching*species + lfm + stem_sav
ERROR: Formula model error: fh ~ branching*species + lfm + thickness
ERROR: Formula model error: fh ~ branching*species + LMA + mpa
ERROR: Formula model error: fh ~ branching*species + LMA + dmc
ERROR: Formula model error: fh ~ branching*species + LMA + branch_volume
ERROR: Formula model error: fh ~ branching*species + LMA + stem_sav
ERROR: Formula model error: fh ~ branching*species + sample_wt + stem_sav
ERROR: Formula model error: fh ~ branching*species + leaf_mass_ratio + dmc
ERROR: Formula model error: fh ~ branching*species + leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + start_temp + thickness
ERROR: Formula model error: fh ~ branching*species + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*species + lfm + sample_wt + mpa
ERROR: Formula model error: fh ~ branching*species + lfm + leaf_mass_ratio +
stem_sav
ERROR: Formula model error: fh ~ branching*species + lfm + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + lfm + mpa + leaf_sav
ERROR: Formula model error: fh ~ branching*species + lfm + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*species + lfm + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ branching*species + LMA + sample_wt + stem_sav
ERROR: Formula model error: fh ~ branching*species + LMA + leaf_mass_ratio +
stem_sav
ERROR: Formula model error: fh ~ branching*species + LMA + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + LMA + start_temp + stem_sav
ERROR: Formula model error: fh ~ branching*species + LMA + dmc + branch_volume
ERROR: Formula model error: fh ~ branching*species + sample_wt + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*species + sample_wt + stem_sav +
leaf_sav
```

```
ERROR: Formula model error: fh ~ branching*species + leaf_mass_ratio + mpa + dmc
ERROR: Formula model error: fh ~ branching*species + leaf_mass_ratio + mpa +
stem_sav
ERROR: Formula model error: fh ~ branching*species + leaf_mass_ratio + dmc +
stem_sav
ERROR: Formula model error: fh ~ branching*species + leaf_mass_ratio + stem_sav
+ leaf_sav
ERROR: Formula model error: fh ~ branching*species + leaf_mass_ratio + leaf_sav
+ thickness
ERROR: Formula model error: fh ~ branching*species + mpa + start_temp + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ branching*species + mpa + leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*species + start_temp + dmc +
thickness
ERROR: Formula model error: fh ~ branching*species + lfm + LMA + sample_wt +
branch_volume
ERROR: Formula model error: fh ~ branching*species + lfm + LMA + leaf_mass_ratio
+ branch_volume
ERROR: Formula model error: fh ~ branching*species + lfm + LMA + mpa + dmc
ERROR: Formula model error: fh ~ branching*species + lfm + LMA + mpa + stem_sav
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stem_sav
ERROR: Formula model error: fh ~ branching*species + lfm + leaf_mass_ratio + mpa
+ start_temp
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+ dmc
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+ stem_sav
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branch_volume + stem_sav
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stem_sav
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thickness
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leaf_sav
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thickness
ERROR: Formula model error: fh ~ branching*species + LMA + sample_wt + dmc +
stem_sav
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+ dmc
ERROR: Formula model error: fh ~ branching*species + LMA + mpa + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*species + sample_wt + leaf_mass_ratio
+ mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + sample_wt + start_temp +
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branch_volume + stem_sav
ERROR: Formula model error: fh ~ branching*species + sample_wt + stem_sav +
leaf_sav + thickness
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start_temp + thickness
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start_temp + dmc + thickness
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thickness
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leaf_mass_ratio + stem_sav
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leaf_mass_ratio + leaf_sav
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leaf_sav
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+ thickness
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branch_volume + stem_sav
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branch_volume + leaf_sav
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leaf_mass_ratio + mpa + branch_volume
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stem_sav + leaf_sav
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branch_volume + leaf_sav + thickness
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branch_volume + stem_sav + leaf_sav
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thickness
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start_temp
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mpa + stem_sav
ERROR: Formula model error: fh ~ lfm*dmc + branching*species + leaf_mass_ratio +
mpa + leaf_sav
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+ stem_sav
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thickness
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leaf_mass_ratio + mpa
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mpa + stem_sav
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mpa + start_temp + stem_sav
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+ stem_sav + leaf_sav
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+ stem_sav + thickness
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leaf_mass_ratio + branching + dmc
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leaf_mass_ratio + mpa + start_temp
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leaf_mass_ratio + stem_sav + thickness
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start_temp + leaf_sav
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stem_sav + leaf_sav
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stem_sav + thickness
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leaf_mass_ratio + dmc + thickness
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leaf_mass_ratio + mpa + dmc + thickness
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branching + stem_sav
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branching + start_temp + thickness
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mpa
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stem_sav
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leaf_mass_ratio + stem_sav
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thickness
ERROR: Formula model error: fh ~ lfm*leaf_sav + branching*species + LMA + mpa +
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```
start_temp
ERROR: Formula model error: fh ~ lfm*leaf_sav + branching*species + LMA + mpa +
dmc
ERROR: Formula model error: fh ~ lfm*leaf_sav + branching*species + LMA + mpa +
stem_sav
ERROR: Formula model error: fh ~ lfm*leaf_sav + branching*species + sample_wt +
leaf_mass_ratio + stem_sav
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leaf_mass_ratio + mpa + stem_sav
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leaf_mass_ratio + mpa + thickness
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leaf_mass_ratio + stem_sav + thickness
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start_temp + dmc
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stem_sav + thickness
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sample_wt + leaf_mass_ratio + mpa
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sample_wt + mpa + dmc
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start_temp + dmc
ERROR: Formula model error: fh ~ lfm*leaf_sav + branching*species + LMA + mpa +
start_temp + stem_sav
ERROR: Formula model error: fh ~ lfm*leaf_sav + branching*species + LMA + mpa +
dmc + stem_sav
ERROR: Formula model error: fh ~ lfm*leaf_sav + branching*species + sample_wt +
leaf_mass_ratio + start_temp + branch_volume
ERROR: Formula model error: fh ~ lfm*leaf_sav + branching*species +
leaf_mass_ratio + mpa + start_temp + stem_sav
ERROR: Formula model error: fh ~ lfm*leaf_sav + branching*species +
leaf_mass_ratio + mpa + dmc + thickness
ERROR: Formula model error: fh ~ lfm*leaf_sav + branching*species +
leaf_mass_ratio + dmc + branch_volume + stem_sav
ERROR: Formula model error: fh ~ lfm*leaf_sav + branching*species + mpa +
start_temp + dmc + stem_sav
ERROR: Formula model error: fh ~ lfm*thickness + LMA*species + sample_wt +
leaf_mass_ratio + branching + branch_volume
ERROR: Formula model error: fh ~ lfm*thickness + LMA*species + leaf_mass_ratio +
branching + branch_volume + leaf_sav
ERROR: Formula model error: fh ~ lfm*thickness + branching*species +
leaf_mass_ratio
ERROR: Formula model error: fh ~ lfm*thickness + branching*species + stem_sav
ERROR: Formula model error: fh ~ lfm*thickness + branching*species + sample_wt +
mpa
ERROR: Formula model error: fh ~ lfm*thickness + branching*species +
leaf_mass_ratio + dmc
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ERROR: Formula model error: fh ~ lfm*thickness + branching*species +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ lfm*thickness + branching*species + mpa +
stem_sav
ERROR: Formula model error: fh ~ lfm*thickness + branching*species + stem_sav +
leaf_sav
ERROR: Formula model error: fh ~ lfm*thickness + branching*species + sample_wt +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ lfm*thickness + branching*species + sample_wt +
dmc + stem_sav
ERROR: Formula model error: fh ~ lfm*thickness + branching*species +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ lfm*thickness + branching*species +
leaf_mass_ratio + dmc + stem_sav
ERROR: Formula model error: fh ~ lfm*thickness + branching*species + mpa +
start_temp + stem_sav
ERROR: Formula model error: fh ~ lfm*thickness + branching*species + LMA +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ lfm*thickness + branching*species + LMA +
leaf_mass_ratio + start_temp + branch_volume
ERROR: Formula model error: fh ~ lfm*thickness + branching*species + sample_wt +
leaf_mass_ratio + mpa + dmc
ERROR: Formula model error: fh ~ lfm*thickness + branching*species + sample_wt +
leaf_mass_ratio + start_temp + stem_sav
ERROR: Formula model error: fh ~ lfm*thickness + branching*species + sample_wt +
leaf_mass_ratio + dmc + branch_volume
ERROR: Formula model error: fh ~ lfm*thickness + branching*species +
leaf_mass_ratio + mpa + start_temp + stem_sav
ERROR: Formula model error: fh ~ lfm*thickness + branching*species +
leaf_mass_ratio + mpa + dmc + stem_sav
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + lfm + mpa
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + sample_wt + thickness
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + lfm + sample_wt + mpa
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + lfm + leaf_mass_ratio +
thickness
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + lfm + branch_volume +
stem_sav
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + sample_wt +
leaf_mass_ratio + start_temp
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + sample_wt + branching +
branch_volume
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + branch_volume +
stem_sav + thickness
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + lfm + sample_wt +
leaf_mass_ratio + branch_volume
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + lfm + sample_wt +
start_temp + stem_sav
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + lfm + leaf_mass_ratio +
```

```
leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + lfm + mpa + start_temp
+ thickness
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + lfm + start_temp +
branch_volume + leaf_sav
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + lfm + start_temp +
leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + sample_wt +
leaf_mass_ratio + branch_volume + leaf_sav
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + sample_wt + branching +
mpa + start_temp
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + sample_wt + mpa +
leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + sample_wt +
branch_volume + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + leaf_mass_ratio +
branching + start_temp + stem_sav
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + leaf_mass_ratio + mpa +
start_temp + thickness
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + branching + mpa +
start_temp + thickness
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + branching + start_temp
+ stem_sav + leaf_sav
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + branching + stem_sav +
leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + mpa + start_temp +
stem_sav + thickness
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + mpa + start_temp +
leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*dmc + LMA*species + branch_volume +
stem_sav + leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*dmc + branching*species + sample_wt +
branch_volume + stem_sav
ERROR: Formula model error: fh ~ LMA*dmc + branching*species + sample_wt + mpa +
start_temp + stem_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + branching +
leaf_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + start_temp
+ stem_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + lfm +
branch_volume + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + sample_wt +
branching + stem_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + sample_wt +
mpa + thickness
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + sample_wt +
start_temp + stem_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + branching +
```

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stem_sav + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + mpa +
branch_volume + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + mpa +
stem_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + lfm +
sample_wt + branching + stem_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + lfm +
sample_wt + stem_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + lfm +
branch_volume + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + sample_wt +
branching + mpa + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + sample_wt +
branching + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + sample_wt +
mpa + start_temp + stem_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + branching +
start_temp + stem_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*dmc + start_temp
+ branch_volume + leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*leaf_sav +
thickness
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*leaf_sav +
sample_wt + mpa
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*leaf_sav +
start_temp + dmc
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*leaf_sav + lfm +
dmc + stem_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*leaf_sav +
sample_wt + branching + dmc
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*leaf_sav +
sample_wt + dmc + branch_volume
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*leaf_sav +
start_temp + dmc + stem_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*leaf_sav + lfm +
sample_wt + mpa + start_temp
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*leaf_sav + lfm +
sample_wt + mpa + stem_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*leaf_sav + lfm +
sample_wt + dmc + branch_volume
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*leaf_sav + lfm +
sample_wt + dmc + thickness
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*leaf_sav + lfm +
sample_wt + branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*leaf_sav + lfm +
dmc + branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*leaf_sav +
```

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sample_wt + start_temp + stem_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*thickness + lfm +
sample_wt
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*thickness +
sample_wt + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*thickness + mpa +
start_temp + dmc
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*thickness +
start_temp + branch_volume + stem_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*thickness + lfm +
sample_wt + start_temp + stem_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*thickness + lfm +
sample_wt + dmc + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*thickness + lfm +
branching + mpa + dmc
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*thickness + lfm +
branching + dmc + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*thickness + lfm +
branch_volume + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*thickness +
sample_wt + branching + dmc + stem_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*thickness +
sample_wt + start_temp + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*thickness +
branching + mpa + start_temp + branch_volume
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*thickness +
branching + mpa + dmc + branch_volume
ERROR: Formula model error: fh ~ LMA*species + leaf_mass_ratio*thickness +
branching + mpa + dmc + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + branching*dmc + sample_wt +
leaf_mass_ratio
ERROR: Formula model error: fh ~ LMA*species + branching*dmc + leaf_mass_ratio +
start_temp
ERROR: Formula model error: fh ~ LMA*species + branching*dmc + lfm + sample_wt +
mpa + stem_sav
ERROR: Formula model error: fh ~ LMA*species + branching*dmc + lfm + sample_wt +
branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + branching*dmc + lfm + start_temp
+ branch_volume + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + branching*dmc + lfm +
branch_volume + leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + branching*dmc + start_temp +
stem_sav + leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + branching*leaf_sav + sample_wt +
leaf_mass_ratio
ERROR: Formula model error: fh ~ LMA*species + branching*leaf_sav + sample_wt +
start_temp + branch_volume
ERROR: Formula model error: fh ~ LMA*species + branching*leaf_sav + sample_wt +
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branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + branching*leaf_sav + mpa +
start_temp + thickness
ERROR: Formula model error: fh ~ LMA*species + branching*leaf_sav + start_temp +
branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + branching*leaf_sav +
leaf_mass_ratio + start_temp + branch_volume + stem_sav
ERROR: Formula model error: fh ~ LMA*species + branching*leaf_sav + mpa +
start_temp + dmc + stem_sav
ERROR: Formula model error: fh ~ LMA*species + branching*leaf_sav + start_temp +
dmc + branch_volume + stem_sav
ERROR: Formula model error: fh ~ LMA*species + branching*leaf_sav + start_temp +
branch_volume + stem_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + branching*thickness + sample_wt +
leaf_mass_ratio + mpa
ERROR: Formula model error: fh ~ LMA*species + branching*thickness + mpa + dmc +
leaf_sav
ERROR: Formula model error: fh ~ LMA*species + branching*thickness + mpa +
branch_volume + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + branching*thickness + start_temp
+ branch_volume + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + branching*thickness + dmc +
branch_volume + stem_sav
ERROR: Formula model error: fh ~ LMA*species + branching*thickness + lfm +
leaf_mass_ratio + dmc + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + branching*thickness + lfm +
start_temp + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + branching*thickness + sample_wt +
leaf_mass_ratio + start_temp + branch_volume
ERROR: Formula model error: fh ~ LMA*species + branching*thickness + mpa +
start_temp + branch_volume + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + branching*thickness + dmc +
branch_volume + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + branching*species + sample_wt +
mpa + start_temp + dmc
ERROR: Formula model error: fh ~ LMA*species + branching*species + sample_wt +
dmc + branch_volume + stem_sav
ERROR: Formula model error: fh ~ LMA*species + branching*species +
leaf_mass_ratio + mpa + dmc + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + mpa*branch_volume + dmc +
thickness
ERROR: Formula model error: fh ~ LMA*species + mpa*branch_volume + sample_wt +
leaf_mass_ratio + start_temp
ERROR: Formula model error: fh ~ LMA*species + mpa*branch_volume + lfm +
sample_wt + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + mpa*branch_volume + lfm +
leaf_mass_ratio + leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + mpa*branch_volume + sample_wt +
```

```
start_temp + dmc + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + mpa*branch_volume + sample_wt +
start_temp + leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + start_temp*dmc + sample_wt +
leaf_mass_ratio
ERROR: Formula model error: fh ~ LMA*species + start_temp*dmc + sample_wt + mpa
ERROR: Formula model error: fh ~ LMA*species + start_temp*dmc + lfm +
branch_volume + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + start_temp*dmc + sample_wt +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ LMA*species + start_temp*dmc + sample_wt +
branching + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + start_temp*dmc + sample_wt +
stem_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + start_temp*dmc + lfm +
leaf_mass_ratio + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + start_temp*dmc + lfm + branching
+ branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + start_temp*dmc + lfm +
branch_volume + leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + start_temp*dmc + sample_wt +
branching + leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + start_temp*dmc + mpa +
branch_volume + leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + start_temp*dmc + branch_volume +
stem_sav + leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*branch_volume + sample_wt
ERROR: Formula model error: fh ~ LMA*species + dmc*branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*branch_volume + lfm +
stem_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*branch_volume + sample_wt +
leaf_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*branch_volume + lfm +
stem_sav + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*branch_volume + mpa +
leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*branch_volume + lfm +
leaf_mass_ratio + branching + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*branch_volume + lfm +
branching + mpa + start_temp
ERROR: Formula model error: fh ~ LMA*species + dmc*branch_volume + lfm + mpa +
start_temp + stem_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*branch_volume +
leaf_mass_ratio + mpa + leaf_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + sample_wt +
leaf_mass_ratio
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + sample_wt +
branching
```

```
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + branch_volume +
thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + lfm + branching +
branch_volume
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + lfm +
branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + sample_wt +
leaf_mass_ratio + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + sample_wt + mpa +
stem_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + sample_wt + mpa +
thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + sample_wt +
start_temp + branch_volume
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + leaf_mass_ratio +
branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + mpa +
branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + start_temp +
branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + lfm + sample_wt +
leaf_mass_ratio + mpa
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + lfm +
leaf_mass_ratio + branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + lfm + branching +
mpa + branch_volume
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + lfm + branching +
mpa + stem_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + lfm + mpa +
branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + sample_wt +
leaf_mass_ratio + mpa + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + sample_wt +
branching + mpa + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + sample_wt +
branching + start_temp + stem_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + sample_wt +
branching + branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + sample_wt + mpa +
start_temp + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + sample_wt + mpa +
branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + sample_wt +
start_temp + branch_volume + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + leaf_mass_ratio +
branching + mpa + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + leaf_mass_ratio +
branch_volume + stem_sav + thickness
```

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ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + branching + mpa +
stem_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + branching +
start_temp + branch_volume + stem_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + branching +
start_temp + stem_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*leaf_sav + start_temp +
branch_volume + stem_sav + thickness
ERROR: Formula model error: fh ~ LMA*species + dmc*thickness + sample_wt +
start_temp
ERROR: Formula model error: fh ~ LMA*species + dmc*thickness + lfm + sample_wt +
leaf_mass_ratio
ERROR: Formula model error: fh ~ LMA*species + dmc*thickness + sample_wt +
branching + start_temp
ERROR: Formula model error: fh ~ LMA*species + dmc*thickness + sample_wt +
branching + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*thickness + sample_wt + mpa +
leaf_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*thickness + sample_wt +
start_temp + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*thickness + sample_wt +
branch_volume + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*thickness + leaf_mass_ratio +
branching + start_temp
ERROR: Formula model error: fh ~ LMA*species + dmc*thickness + branching + mpa +
start_temp
ERROR: Formula model error: fh ~ LMA*species + dmc*thickness + start_temp +
branch_volume + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*thickness + lfm +
leaf_mass_ratio + mpa + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*thickness + lfm +
leaf_mass_ratio + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*thickness + lfm + mpa +
branch_volume + stem_sav
ERROR: Formula model error: fh ~ LMA*species + dmc*thickness + mpa + start_temp
+ branch_volume + leaf_sav
ERROR: Formula model error: fh ~ sample_wt*species + branching*species + lfm +
mpa + branch_volume + leaf_sav
ERROR: Formula model error: fh ~ sample_wt*species + mpa*species + lfm + dmc +
thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + LMA
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species +
stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + lfm +
stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species +
sample_wt + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species +
```

```
start_temp + leaf_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + lfm +
LMA + mpa
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + lfm +
sample_wt + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + lfm +
mpa + start_temp
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + LMA +
sample_wt + mpa
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + LMA +
mpa + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species +
sample_wt + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species +
sample_wt + stem_sav + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + mpa +
start_temp + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species +
stem_sav + leaf_sav + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + lfm +
LMA + sample_wt + mpa
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + lfm +
LMA + mpa + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + lfm +
sample_wt + mpa + branch_volume
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + lfm +
sample_wt + start_temp + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + lfm +
sample_wt + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + lfm +
mpa + start_temp + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + lfm +
mpa + leaf_sav + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + LMA +
sample_wt + mpa + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + LMA +
sample_wt + mpa + leaf_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species + LMA +
sample_wt + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*dmc + branching*species +
sample_wt + stem_sav + leaf_sav + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
lfm + mpa
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
lfm + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
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```
mpa + dmc
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
mpa + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
mpa + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
dmc + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
stem_sav + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
lfm + mpa + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
lfm + mpa + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
lfm + dmc + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
LMA + sample_wt + mpa
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
LMA + mpa + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
LMA + dmc + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
sample_wt + dmc + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
sample_wt + stem_sav + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
mpa + start_temp + dmc
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
mpa + start_temp + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
mpa + start_temp + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
mpa + dmc + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
mpa + stem_sav + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
lfm + LMA + mpa + start_temp
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
lfm + LMA + mpa + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
lfm + sample_wt + mpa + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
lfm + sample_wt + dmc + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
lfm + sample_wt + branch_volume + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
lfm + mpa + start_temp + dmc
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
```

```
lfm + mpa + start_temp + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
lfm + mpa + dmc + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
LMA + sample_wt + mpa + dmc
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
LMA + sample_wt + mpa + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
mpa + start_temp + dmc + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
mpa + start_temp + dmc + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
mpa + start_temp + stem_sav + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*leaf_sav + branching*species +
mpa + dmc + stem_sav + thickness
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
lfm
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
dmc
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
lfm + mpa
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
lfm + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
mpa + dmc
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
start_temp + dmc
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
dmc + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
dmc + leaf_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
lfm + sample_wt + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
lfm + mpa + dmc
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
lfm + dmc + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
lfm + dmc + leaf_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
sample_wt + dmc + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
mpa + start_temp + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
mpa + dmc + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
```

```
lfm + sample_wt + start_temp + branch_volume
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
lfm + mpa + start_temp + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
lfm + mpa + dmc + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
LMA + sample_wt + mpa + stem_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
sample_wt + mpa + start_temp + leaf_sav
ERROR: Formula model error: fh ~ leaf_mass_ratio*thickness + branching*species +
mpa + start_temp + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species +
leaf_mass_ratio
ERROR: Formula model error: fh ~ branching*dmc + branching*species + stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species + thickness
ERROR: Formula model error: fh ~ branching*dmc + branching*species + lfm +
thickness
ERROR: Formula model error: fh ~ branching*dmc + branching*species + sample_wt +
stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species + mpa +
stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species + stem_sav +
thickness
ERROR: Formula model error: fh ~ branching*dmc + branching*species + lfm +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species + lfm + mpa +
stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species + lfm +
stem_sav + thickness
ERROR: Formula model error: fh ~ branching*dmc + branching*species + LMA +
leaf_mass_ratio + mpa
ERROR: Formula model error: fh ~ branching*dmc + branching*species + LMA + mpa +
leaf_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species + sample_wt +
branch_volume + stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species + mpa +
start_temp + thickness
ERROR: Formula model error: fh ~ branching*dmc + branching*species + mpa +
branch_volume + stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species + mpa +
leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*dmc + branching*species + stem_sav +
leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*dmc + branching*species + lfm + LMA +
```

```
mpa + stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species + lfm + LMA +
start_temp + stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species + lfm +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species + LMA +
sample_wt + leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species +
leaf_mass_ratio + mpa + start_temp + stem_sav
ERROR: Formula model error: fh ~ branching*dmc + branching*species +
leaf_mass_ratio + mpa + leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*dmc + branching*species +
leaf_mass_ratio + start_temp + leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species +
stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + lfm +
leaf_mass_ratio
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + lfm +
dmc
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + lfm +
stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + LMA +
mpa
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species +
sample_wt + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species +
leaf_mass_ratio + dmc
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + mpa +
dmc
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + mpa +
stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + dmc +
stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species +
stem_sav + thickness
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + lfm +
sample_wt + dmc
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + lfm +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + lfm +
mpa + thickness
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + lfm +
dmc + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + lfm +
dmc + thickness
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + LMA +
sample_wt + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + LMA +
```

```
mpa + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + LMA +
dmc + branch_volume
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species +
leaf_mass_ratio + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species +
leaf_mass_ratio + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + mpa +
start_temp + dmc
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + mpa +
dmc + thickness
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species +
start_temp + branch_volume + thickness
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + lfm +
LMA + leaf_mass_ratio + mpa
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + lfm +
LMA + mpa + dmc
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + lfm +
LMA + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + lfm +
leaf_mass_ratio + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + lfm +
leaf_mass_ratio + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + lfm +
mpa + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + LMA +
sample_wt + leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + LMA +
sample_wt + mpa + dmc
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + LMA +
sample_wt + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + LMA +
sample_wt + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + LMA +
leaf_mass_ratio + mpa + dmc
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + LMA +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + LMA +
leaf_mass_ratio + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + LMA +
mpa + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species +
sample_wt + leaf_mass_ratio + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species +
sample_wt + leaf_mass_ratio + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species +
```

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leaf_mass_ratio + mpa + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species +
leaf_mass_ratio + start_temp + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species +
leaf_mass_ratio + start_temp + dmc + thickness
ERROR: Formula model error: fh ~ branching*leaf_sav + branching*species + mpa +
dmc + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*thickness + branching*species + dmc
ERROR: Formula model error: fh ~ branching*thickness + branching*species +
stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
leaf_mass_ratio
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
mpa
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species +
start_temp + dmc
ERROR: Formula model error: fh ~ branching*thickness + branching*species + dmc +
stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species +
stem_sav + leaf_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
sample_wt + branch_volume
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
sample_wt + stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
mpa + stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
start_temp + stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
dmc + stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species +
sample_wt + leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species +
leaf_mass_ratio + mpa + leaf_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species +
leaf_mass_ratio + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
LMA + sample_wt + branch_volume
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
sample_wt + leaf_mass_ratio + mpa
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
sample_wt + leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
leaf_mass_ratio + mpa + start_temp
```

```
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
leaf_mass_ratio + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
mpa + start_temp + stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
mpa + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species + lfm +
dmc + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species + LMA +
sample_wt + dmc + leaf_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species +
leaf_mass_ratio + mpa + start_temp + dmc
ERROR: Formula model error: fh ~ branching*thickness + branching*species +
leaf_mass_ratio + mpa + start_temp + stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species +
leaf_mass_ratio + mpa + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*thickness + branching*species +
leaf_mass_ratio + mpa + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ branching*species + mpa*branch_volume + lfm +
LMA
ERROR: Formula model error: fh ~ branching*species + mpa*branch_volume + lfm +
LMA + dmc
ERROR: Formula model error: fh ~ branching*species + mpa*branch_volume + lfm +
LMA + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*branch_volume + lfm +
LMA + thickness
ERROR: Formula model error: fh ~ branching*species + mpa*branch_volume + lfm +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*branch_volume +
start_temp + dmc + thickness
ERROR: Formula model error: fh ~ branching*species + mpa*branch_volume + lfm +
LMA + sample_wt + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*branch_volume + lfm +
LMA + start_temp + thickness
ERROR: Formula model error: fh ~ branching*species + mpa*branch_volume + lfm +
LMA + leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*species + mpa*branch_volume + lfm +
start_temp + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*branch_volume +
leaf_mass_ratio + start_temp + dmc + leaf_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + lfm +
stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + LMA +
sample_wt
ERROR: Formula model error: fh ~ branching*species + mpa*species + LMA +
```

```
stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species +
leaf_mass_ratio + leaf_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + start_temp +
stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + stem_sav +
thickness
ERROR: Formula model error: fh ~ branching*species + mpa*species + lfm + LMA +
sample_wt
ERROR: Formula model error: fh ~ branching*species + mpa*species + lfm + LMA +
leaf_mass_ratio
ERROR: Formula model error: fh ~ branching*species + mpa*species + lfm +
leaf_mass_ratio + start_temp
ERROR: Formula model error: fh ~ branching*species + mpa*species + lfm +
start_temp + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + lfm + dmc +
stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + LMA +
sample_wt + leaf_mass_ratio
ERROR: Formula model error: fh ~ branching*species + mpa*species + LMA +
sample_wt + dmc
ERROR: Formula model error: fh ~ branching*species + mpa*species + LMA +
sample_wt + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + LMA +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species +
leaf_mass_ratio + start_temp + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species +
leaf_mass_ratio + start_temp + leaf_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species +
leaf_mass_ratio + dmc + leaf_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species +
leaf_mass_ratio + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species +
leaf_mass_ratio + leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*species + mpa*species + start_temp +
stem_sav + leaf_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + start_temp +
stem_sav + thickness
ERROR: Formula model error: fh ~ branching*species + mpa*species + dmc +
stem_sav + thickness
ERROR: Formula model error: fh ~ branching*species + mpa*species + dmc +
leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*species + mpa*species + lfm + LMA +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + lfm + LMA +
```

```
start_temp + dmc
ERROR: Formula model error: fh ~ branching*species + mpa*species + lfm + LMA +
dmc + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + lfm +
sample_wt + leaf_mass_ratio + thickness
ERROR: Formula model error: fh ~ branching*species + mpa*species + lfm +
leaf_mass_ratio + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + lfm +
leaf_mass_ratio + leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*species + mpa*species + lfm + dmc +
stem_sav + leaf_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + LMA +
sample_wt + leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + LMA +
sample_wt + dmc + leaf_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + LMA +
leaf_mass_ratio + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + LMA + dmc +
stem_sav + leaf_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species + sample_wt +
start_temp + dmc + thickness
ERROR: Formula model error: fh ~ branching*species + mpa*species +
leaf_mass_ratio + start_temp + dmc + thickness
ERROR: Formula model error: fh ~ branching*species + mpa*species +
leaf_mass_ratio + start_temp + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ branching*species + mpa*species +
leaf_mass_ratio + dmc + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*species + mpa*species + start_temp +
dmc + leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*species + start_temp*dmc + mpa
ERROR: Formula model error: fh ~ branching*species + start_temp*dmc + mpa +
stem_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*dmc + mpa +
leaf_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*dmc + lfm + mpa
+ stem_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*dmc + lfm + mpa
+ leaf_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*dmc + LMA +
leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*species + start_temp*dmc +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*dmc + lfm + LMA
+ mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*dmc + lfm +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*dmc + lfm + mpa
+ leaf_sav + thickness
```

```
ERROR: Formula model error: fh ~ branching*species + start_temp*dmc + LMA +
sample_wt + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*dmc + sample_wt
+ leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*species +
leaf_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*species + LMA +
mpa
ERROR: Formula model error: fh ~ branching*species + start_temp*species + mpa +
stem_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*species +
leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*species + start_temp*species + lfm +
mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*species + lfm +
dmc + leaf_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*species + lfm +
stem_sav + leaf_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*species + LMA +
sample_wt + mpa
ERROR: Formula model error: fh ~ branching*species + start_temp*species +
leaf_mass_ratio + mpa + thickness
ERROR: Formula model error: fh ~ branching*species + start_temp*species + mpa +
dmc + leaf_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*species + mpa +
leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*species + start_temp*species + lfm +
LMA + sample_wt + mpa
ERROR: Formula model error: fh ~ branching*species + start_temp*species + lfm +
LMA + mpa + dmc
ERROR: Formula model error: fh ~ branching*species + start_temp*species + lfm +
LMA + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*species + lfm +
sample_wt + leaf_mass_ratio + branch_volume
ERROR: Formula model error: fh ~ branching*species + start_temp*species + lfm +
leaf_mass_ratio + mpa + dmc
ERROR: Formula model error: fh ~ branching*species + start_temp*species + lfm +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*species + LMA +
leaf_mass_ratio + mpa + dmc
ERROR: Formula model error: fh ~ branching*species + start_temp*species +
sample_wt + dmc + branch_volume + stem_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*species +
leaf_mass_ratio + mpa + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*species + start_temp*species +
leaf_mass_ratio + mpa + dmc + thickness
ERROR: Formula model error: fh ~ branching*species + start_temp*species +
leaf_mass_ratio + mpa + leaf_sav + thickness
```

```
ERROR: Formula model error: fh ~ branching*species + start_temp*species +
leaf_mass_ratio + dmc + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*species + dmc*branch_volume + lfm +
sample_wt
ERROR: Formula model error: fh ~ branching*species + dmc*branch_volume + lfm +
thickness
ERROR: Formula model error: fh ~ branching*species + dmc*branch_volume + lfm +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*branch_volume + LMA +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*branch_volume +
sample_wt + mpa + start_temp + thickness
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + thickness
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm +
leaf_mass_ratio
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm +
stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + mpa +
start_temp
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + mpa +
thickness
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm +
sample_wt + mpa
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm +
sample_wt + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm +
leaf_mass_ratio + thickness
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm + mpa +
stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + LMA +
leaf_mass_ratio + mpa
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + sample_wt +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav +
leaf_mass_ratio + mpa + thickness
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + mpa +
start_temp + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + mpa +
start_temp + thickness
```

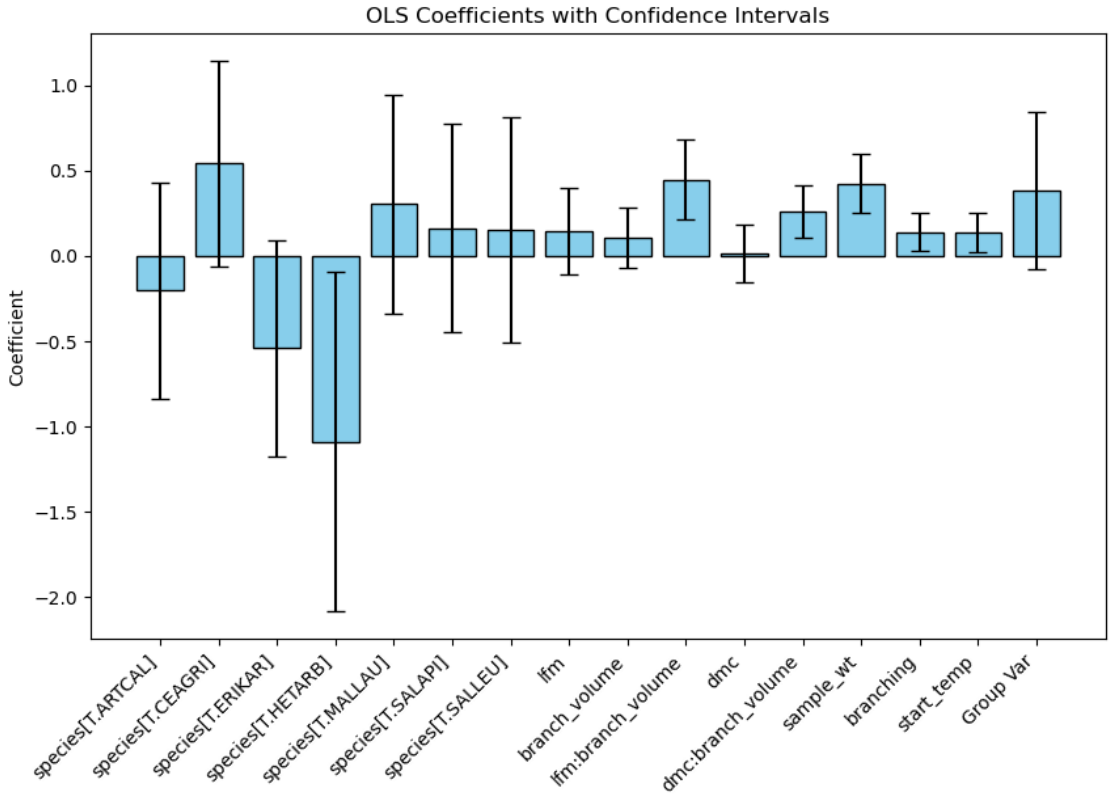
```
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav +
branch_volume + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm + LMA +
mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm +
sample_wt + leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm +
sample_wt + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm +
leaf_mass_ratio + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm + mpa +
start_temp + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + lfm + mpa +
start_temp + thickness
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav + LMA +
sample_wt + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav +
leaf_mass_ratio + mpa + start_temp + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*leaf_sav +
leaf_mass_ratio + mpa + start_temp + thickness
ERROR: Formula model error: fh ~ branching*species + dmc*thickness + sample_wt +
stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*thickness +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*thickness + lfm +
sample_wt + mpa
ERROR: Formula model error: fh ~ branching*species + dmc*thickness + lfm +
sample_wt + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*thickness + lfm + mpa +
stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*thickness + LMA +
sample_wt + branch_volume
ERROR: Formula model error: fh ~ branching*species + dmc*thickness + sample_wt +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*thickness +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*thickness + lfm + LMA +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*thickness + lfm +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*thickness + lfm + mpa +
start_temp + stem_sav
ERROR: Formula model error: fh ~ branching*species + dmc*thickness + sample_wt +
mpa + start_temp + leaf_sav
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + stem_sav
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + lfm +
```

```
stem_sav
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + mpa +
stem_sav
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + stem_sav
+ thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + lfm +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + lfm +
leaf_mass_ratio + thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + lfm +
mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species +
leaf_mass_ratio + mpa + thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species +
leaf_mass_ratio + dmc + stem_sav
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + mpa +
dmc + thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + lfm +
sample_wt + leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + lfm +
sample_wt + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + lfm +
leaf_mass_ratio + mpa + thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + lfm +
leaf_mass_ratio + dmc + thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + lfm +
leaf_mass_ratio + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + lfm +
mpa + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + LMA +
sample_wt + leaf_mass_ratio + mpa
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + LMA +
sample_wt + mpa + dmc
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + LMA +
sample_wt + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species +
sample_wt + leaf_mass_ratio + mpa + branch_volume
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species +
sample_wt + dmc + branch_volume + thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species +
sample_wt + dmc + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species +
leaf_mass_ratio + mpa + start_temp + stem_sav
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species +
```

```
leaf_mass_ratio + mpa + start_temp + thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species +
leaf_mass_ratio + dmc + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + mpa +
start_temp + dmc + thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + mpa +
start_temp + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*species + leaf_sav*species + mpa +
dmc + stem_sav + thickness
ERROR: Formula model error: fh ~ branching*species + thickness*species + mpa
ERROR: Formula model error: fh ~ branching*species + thickness*species +
stem_sav
ERROR: Formula model error: fh ~ branching*species + thickness*species + lfm +
stem_sav
ERROR: Formula model error: fh ~ branching*species + thickness*species +
sample_wt + leaf_sav
ERROR: Formula model error: fh ~ branching*species + thickness*species +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + thickness*species + mpa +
dmc
ERROR: Formula model error: fh ~ branching*species + thickness*species + mpa +
stem_sav
ERROR: Formula model error: fh ~ branching*species + thickness*species +
start_temp + dmc
ERROR: Formula model error: fh ~ branching*species + thickness*species + dmc +
stem_sav
ERROR: Formula model error: fh ~ branching*species + thickness*species + lfm +
leaf_mass_ratio + dmc
ERROR: Formula model error: fh ~ branching*species + thickness*species + lfm +
dmc + stem_sav
ERROR: Formula model error: fh ~ branching*species + thickness*species +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ branching*species + thickness*species + mpa +
start_temp + dmc
ERROR: Formula model error: fh ~ branching*species + thickness*species + lfm +
sample_wt + leaf_mass_ratio + stem_sav
ERROR: Formula model error: fh ~ branching*species + thickness*species +
sample_wt + leaf_mass_ratio + start_temp + branch_volume
ERROR: Formula model error: fh ~ branching*species + thickness*species +
sample_wt + start_temp + branch_volume + leaf_sav
ERROR: Formula model error: fh ~ branching*species + thickness*species +
leaf_mass_ratio + mpa + start_temp + dmc
ERROR: Formula model error: fh ~ branching*species + thickness*species + mpa +
start_temp + dmc + leaf_sav
ERROR: Formula model error: fh ~ branching*species + thickness*species + mpa +
dmc + stem_sav + leaf_sav
ERROR: Formula model error: fh ~ start_temp*species + leaf_sav*species + lfm +
leaf_mass_ratio
```

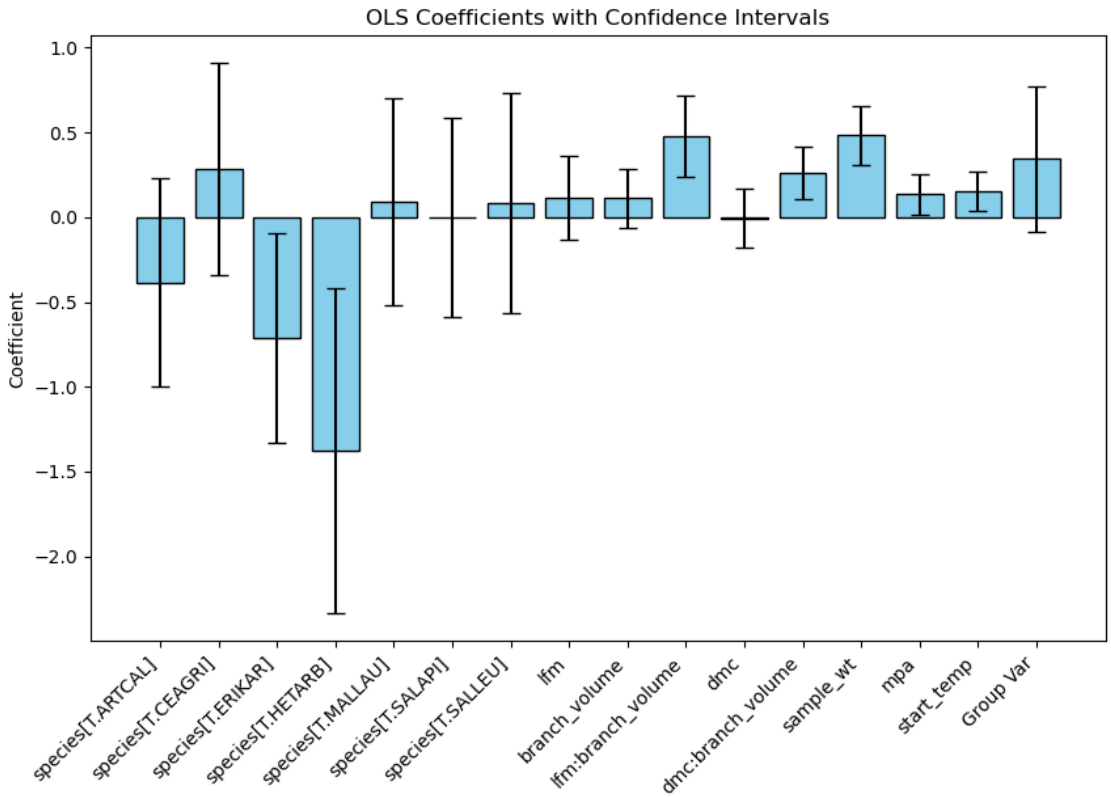
```
ERROR: Formula model error: fh ~ start_temp*species + leaf_sav*species +
branching + thickness
ERROR: Formula model error: fh ~ start_temp*species + leaf_sav*species + dmc +
thickness
ERROR: Formula model error: fh ~ start_temp*species + leaf_sav*species + lfm +
LMA + stem_sav
ERROR: Formula model error: fh ~ start_temp*species + leaf_sav*species + LMA +
stem_sav + thickness
ERROR: Formula model error: fh ~ start_temp*species + leaf_sav*species + lfm +
leaf_mass_ratio + mpa + stem_sav
ERROR: Formula model error: fh ~ start_temp*species + leaf_sav*species + lfm +
leaf_mass_ratio + dmc + stem_sav
ERROR: Formula model error: fh ~ start_temp*species + leaf_sav*species + lfm +
leaf_mass_ratio + dmc + thickness
ERROR: Formula model error: fh ~ start_temp*species + leaf_sav*species + LMA +
leaf_mass_ratio + stem_sav + thickness
ERROR: Formula model error: fh ~ start_temp*species + leaf_sav*species +
leaf_mass_ratio + branching + mpa + thickness
ERROR: Formula model error: fh ~ start_temp*species + leaf_sav*species +
leaf_mass_ratio + dmc + stem_sav + thickness


fh ~ lfm*branch_volume + dmc*branch_volume + sample_wt + branching + start_temp
+ species
fh ~ lfm*branch_volume + dmc*branch_volume + sample_wt + mpa + start_temp +
species
fh ~ mpa*branch_volume + sample_wt + branching + start_temp + species
fh ~ lfm*branch_volume + mpa*branch_volume + sample_wt + branching + start_temp
+ species


           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fh
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.2141
Min. group size:     1        Log-Likelihood:      -124.2402
Max. group size:     11       Converged:           Yes
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept          0.025    0.254  0.099 0.921 -0.473  0.524
species[T.ARTCAL] -0.203    0.322 -0.631 0.528 -0.835  0.428
species[T.CEAGRI]  0.541    0.306  1.767 0.077 -0.059  1.141
species[T.ERIKAR] -0.541    0.324 -1.669 0.095 -1.176  0.094
species[T.HETARB] -1.089    0.508 -2.145 0.032 -2.084 -0.094
species[T.MALLAU]  0.304    0.327  0.929 0.353 -0.337  0.946
```

```
species[T.SALAPI]   0.163    0.312  0.524 0.601 -0.448  0.775
species[T.SALLEU]   0.153    0.339  0.451 0.652 -0.511  0.817
lfm                 0.143    0.129  1.109 0.267 -0.110  0.397
branch_volume       0.105    0.090  1.165 0.244 -0.072  0.282
lfm:branch_volume   0.448    0.121  3.715 0.000  0.212  0.685
dmc                 0.017    0.086  0.200 0.842 -0.151  0.185
dmc:branch_volume   0.260    0.078  3.340 0.001  0.108  0.413
sample_wt           0.425    0.089  4.792 0.000  0.251  0.599
branching           0.139    0.057  2.452 0.014  0.028  0.250
start_temp          0.139    0.059  2.368 0.018  0.024  0.253
Group Var           0.083    0.109
============================================================
```




```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fh
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.2195
Min. group size:     1        Log-Likelihood:      -124.7650
Max. group size:     11       Converged:           Yes
Mean group size:     3.0
```

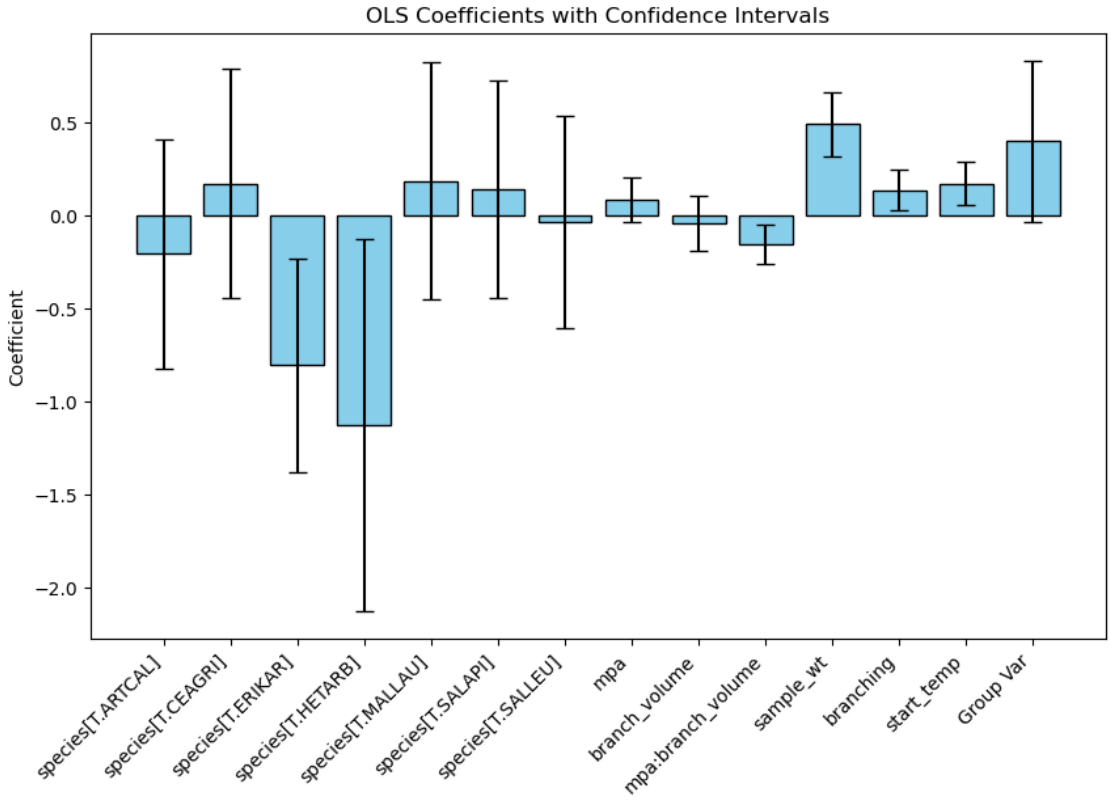
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.199	0.247	0.804	0.421	-0.286	0.683
species[T.ARTCAL]	-0.384	0.314	-1.223	0.221	-0.999	0.231
species[T.CEAGRI]	0.285	0.318	0.897	0.370	-0.338	0.909
species[T.ERIKAR]	-0.712	0.314	-2.264	0.024	-1.328	-0.096
species[T.HETARB]	-1.377	0.490	-2.809	0.005	-2.338	-0.416
species[T.MALLAU]	0.092	0.312	0.296	0.767	-0.520	0.705
species[T.SALAPI]	-0.003	0.301	-0.009	0.993	-0.592	0.587
species[T.SALLEU]	0.081	0.331	0.243	0.808	-0.569	0.730
lfm	0.113	0.127	0.895	0.371	-0.135	0.361
branch_volume	0.111	0.091	1.230	0.219	-0.066	0.289
lfm:branch_volume	0.479	0.122	3.927	0.000	0.240	0.719
dmc	-0.005	0.087	-0.062	0.950	-0.176	0.165
dmc:branch_volume	0.261	0.078	3.324	0.001	0.107	0.414
sample_wt	0.483	0.090	5.376	0.000	0.307	0.659
mpa	0.137	0.061	2.229	0.026	0.017	0.257
start_temp	0.151	0.059	2.551	0.011	0.035	0.267
Group Var	0.075	0.102				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fh
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.2199
Min. group size:	1	Log-Likelihood:	-126.8658
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.146	0.252	0.579	0.563	-0.348	0.640
species[T.ARTCAL]	-0.208	0.314	-0.662	0.508	-0.824	0.408
species[T.CEAGRI]	0.169	0.314	0.540	0.589	-0.445	0.784
species[T.ERIKAR]	-0.806	0.293	-2.749	0.006	-1.380	-0.231
species[T.HETARB]	-1.130	0.509	-2.219	0.026	-2.127	-0.132
species[T.MALLAU]	0.183	0.325	0.564	0.572	-0.453	0.820
species[T.SALAPI]	0.139	0.298	0.468	0.640	-0.444	0.723
species[T.SALLEU]	-0.037	0.291	-0.128	0.898	-0.607	0.532
mpa	0.084	0.061	1.372	0.170	-0.036	0.203
branch_volume	-0.046	0.075	-0.612	0.541	-0.193	0.101
mpa:branch_volume	-0.160	0.054	-2.979	0.003	-0.265	-0.055
sample_wt	0.490	0.089	5.533	0.000	0.316	0.664
branching	0.135	0.057	2.379	0.017	0.024	0.246
start_temp	0.170	0.060	2.834	0.005	0.053	0.288
Group Var	0.088	0.104				

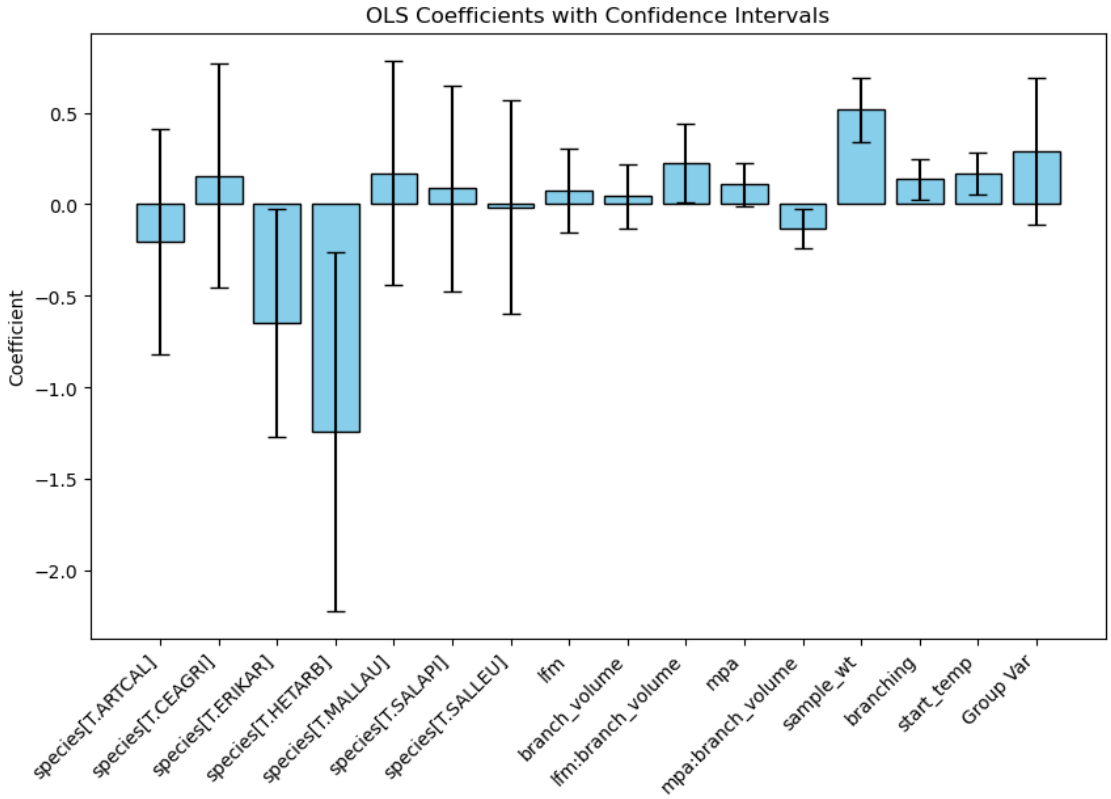


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fh
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.2254
Min. group size:	1	Log-Likelihood:	-124.8726
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.176	0.243	0.727	0.467	-0.299	0.652
species[T.ARTCAL]	-0.205	0.314	-0.652	0.514	-0.821	0.411
species[T.CEAGRI]	0.157	0.311	0.504	0.614	-0.452	0.765
species[T.ERIKAR]	-0.648	0.317	-2.046	0.041	-1.268	-0.027
species[T.HETARB]	-1.240	0.499	-2.485	0.013	-2.218	-0.262
species[T.MALLAU]	0.171	0.313	0.547	0.585	-0.443	0.786
species[T.SALAPI]	0.087	0.286	0.305	0.760	-0.473	0.648
species[T.SALLEU]	-0.016	0.297	-0.054	0.957	-0.598	0.565
lfm	0.076	0.117	0.649	0.516	-0.154	0.306
branch_volume	0.043	0.088	0.490	0.624	-0.130	0.216
lfm:branch_volume	0.223	0.110	2.025	0.043	0.007	0.438

```
mpa                 0.108    0.061   1.760 0.078 -0.012  0.228
mpa:branch_volume -0.136    0.055 -2.464 0.014 -0.243 -0.028
sample_wt           0.515    0.089   5.806 0.000  0.341  0.689
branching           0.136    0.057   2.372 0.018  0.024  0.249
start_temp          0.167    0.059   2.852 0.004  0.052  0.282
Group Var           0.065    0.097
============================================================
```



5 Flame Duration

[8]:
```
AIC_iterator(flam, cols_use, Y_VAR='fd',
             minnumsingle=mns, maxnumsingle=mxs, minnumint=mni, maxnumint=mxi)
```

```
Columns present in sig. interaction terms: {'sample_wt', 'branch_volume',
'branching', 'stem_sav', 'thickness', 'LMA', 'leaf_sav', 'lfm', 'mpa',
'leaf_mass_ratio', 'dmc', 'species'}

Total Num. Cols : Num. Sig. Int. Cols;  13 : 12
```

```
Significant Interactions:
('lfm', 'LMA')
('lfm', 'sample_wt')
('lfm', 'leaf_mass_ratio')
('lfm', 'stem_sav')
('lfm', 'species')
('LMA', 'leaf_sav')
('LMA', 'thickness')
('LMA', 'species')
('sample_wt', 'dmc')
('sample_wt', 'leaf_sav')
('sample_wt', 'species')
('leaf_mass_ratio', 'dmc')
('branching', 'stem_sav')
('mpa', 'branch_volume')

Number of formulas: 34934
ERROR: Formula model error: fd ~ LMA*species + sample_wt
ERROR: Formula model error: fd ~ LMA*species + lfm + leaf_mass_ratio
ERROR: Formula model error: fd ~ LMA*species + sample_wt + leaf_mass_ratio
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio + mpa
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio + dmc
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + branching + dmc
ERROR: Formula model error: fd ~ LMA*species + start_temp + stem_sav
ERROR: Formula model error: fd ~ LMA*species + dmc + stem_sav
ERROR: Formula model error: fd ~ LMA*species + leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + lfm + sample_wt + start_temp
ERROR: Formula model error: fd ~ LMA*species + lfm + leaf_mass_ratio + dmc
ERROR: Formula model error: fd ~ LMA*species + lfm + mpa + stem_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt + leaf_mass_ratio +
branch_volume
ERROR: Formula model error: fd ~ LMA*species + sample_wt + branching + mpa
ERROR: Formula model error: fd ~ LMA*species + sample_wt + mpa + dmc
ERROR: Formula model error: fd ~ LMA*species + sample_wt + mpa + branch_volume
ERROR: Formula model error: fd ~ LMA*species + sample_wt + mpa + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt + mpa + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt + start_temp + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt + leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio + mpa + dmc
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio + mpa +
branch_volume
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio + dmc + stem_sav
ERROR: Formula model error: fd ~ LMA*species + branching + mpa + start_temp
ERROR: Formula model error: fd ~ LMA*species + branching + branch_volume +
stem_sav
ERROR: Formula model error: fd ~ LMA*species + branching + branch_volume +
leaf_sav
```

```
ERROR: Formula model error: fd ~ LMA*species + start_temp + dmc + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + start_temp + dmc + thickness
ERROR: Formula model error: fd ~ LMA*species + lfm + sample_wt + leaf_mass_ratio
+ branching
ERROR: Formula model error: fd ~ LMA*species + lfm + sample_wt + mpa + dmc
ERROR: Formula model error: fd ~ LMA*species + lfm + sample_wt + branch_volume +
stem_sav
ERROR: Formula model error: fd ~ LMA*species + lfm + leaf_mass_ratio + mpa + dmc
ERROR: Formula model error: fd ~ LMA*species + lfm + mpa + dmc + branch_volume
ERROR: Formula model error: fd ~ LMA*species + lfm + mpa + branch_volume +
stem_sav
ERROR: Formula model error: fd ~ LMA*species + lfm + dmc + branch_volume +
thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt + leaf_mass_ratio + mpa
+ leaf_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt + leaf_mass_ratio + dmc
+ thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt + leaf_mass_ratio +
leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt + branching + mpa + dmc
ERROR: Formula model error: fd ~ LMA*species + sample_wt + branching + mpa +
stem_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt + mpa + start_temp +
dmc
ERROR: Formula model error: fd ~ LMA*species + sample_wt + mpa + branch_volume +
leaf_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt + dmc + stem_sav +
thickness
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio + branch_volume +
leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + mpa + start_temp + branch_volume
+ leaf_sav
ERROR: Formula model error: fd ~ LMA*species + mpa + start_temp + branch_volume
+ thickness
ERROR: Formula model error: fd ~ LMA*species + mpa + dmc + stem_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + start_temp + branch_volume +
leaf_sav + thickness
ERROR: Formula model error: fd ~ lfm*LMA + LMA*species + thickness
ERROR: Formula model error: fd ~ lfm*LMA + LMA*species + sample_wt +
leaf_mass_ratio + stem_sav + thickness
ERROR: Formula model error: fd ~ lfm*LMA + LMA*species + sample_wt + branching +
start_temp + branch_volume
ERROR: Formula model error: fd ~ lfm*LMA + LMA*species + mpa + dmc + stem_sav +
thickness
ERROR: Formula model error: fd ~ lfm*LMA + LMA*species + start_temp +
branch_volume + stem_sav + thickness
ERROR: Formula model error: fd ~ lfm*sample_wt + LMA*species + leaf_mass_ratio +
mpa + start_temp
```

```
ERROR: Formula model error: fd ~ lfm*sample_wt + LMA*species + leaf_mass_ratio +
start_temp + branch_volume
ERROR: Formula model error: fd ~ lfm*sample_wt + LMA*species + leaf_mass_ratio +
dmc + thickness
ERROR: Formula model error: fd ~ lfm*sample_wt + LMA*species + branching + mpa +
stem_sav
ERROR: Formula model error: fd ~ lfm*sample_wt + LMA*species + mpa + leaf_sav +
thickness
ERROR: Formula model error: fd ~ lfm*sample_wt + LMA*species + start_temp +
branch_volume + leaf_sav
ERROR: Formula model error: fd ~ lfm*sample_wt + LMA*species + branch_volume +
leaf_sav + thickness
ERROR: Formula model error: fd ~ lfm*sample_wt + LMA*species + leaf_mass_ratio +
start_temp + dmc + branch_volume
ERROR: Formula model error: fd ~ lfm*sample_wt + LMA*species + leaf_mass_ratio +
dmc + leaf_sav + thickness
ERROR: Formula model error: fd ~ lfm*sample_wt + LMA*species + leaf_mass_ratio +
branch_volume + leaf_sav + thickness
ERROR: Formula model error: fd ~ lfm*sample_wt + LMA*species + branching +
start_temp + branch_volume + leaf_sav
ERROR: Formula model error: fd ~ lfm*sample_wt + LMA*species + mpa + dmc +
branch_volume + thickness
ERROR: Formula model error: fd ~ lfm*sample_wt + LMA*species + mpa + dmc +
leaf_sav + thickness
ERROR: Formula model error: fd ~ lfm*leaf_mass_ratio + LMA*species + start_temp
+ leaf_sav
ERROR: Formula model error: fd ~ lfm*leaf_mass_ratio + LMA*species + branching +
branch_volume + thickness
ERROR: Formula model error: fd ~ lfm*leaf_mass_ratio + LMA*species + branching +
stem_sav + leaf_sav
ERROR: Formula model error: fd ~ lfm*leaf_mass_ratio + LMA*species + mpa +
start_temp + dmc
ERROR: Formula model error: fd ~ lfm*leaf_mass_ratio + LMA*species + dmc +
branch_volume + stem_sav
ERROR: Formula model error: fd ~ lfm*leaf_mass_ratio + LMA*species + sample_wt +
branching + dmc + branch_volume
ERROR: Formula model error: fd ~ lfm*leaf_mass_ratio + LMA*species + sample_wt +
mpa + leaf_sav + thickness
ERROR: Formula model error: fd ~ lfm*leaf_mass_ratio + LMA*species + mpa +
start_temp + dmc + stem_sav
ERROR: Formula model error: fd ~ lfm*stem_sav + LMA*species + mpa + leaf_sav
ERROR: Formula model error: fd ~ lfm*stem_sav + LMA*species + sample_wt +
start_temp + leaf_sav
ERROR: Formula model error: fd ~ lfm*stem_sav + LMA*species + branching + mpa +
start_temp
ERROR: Formula model error: fd ~ lfm*stem_sav + LMA*species + branching + mpa +
leaf_sav
ERROR: Formula model error: fd ~ lfm*stem_sav + LMA*species + sample_wt +
```

```
branching + mpa + leaf_sav
ERROR: Formula model error: fd ~ lfm*stem_sav + LMA*species + mpa + start_temp +
branch_volume + leaf_sav
ERROR: Formula model error: fd ~ lfm*species + LMA*species + mpa + start_temp +
dmc
ERROR: Formula model error: fd ~ lfm*species + sample_wt*species + dmc +
stem_sav
ERROR: Formula model error: fd ~ lfm*species + sample_wt*species +
leaf_mass_ratio + mpa + dmc
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + leaf_mass_ratio
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + lfm + sample_wt
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + sample_wt +
branch_volume
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + leaf_mass_ratio +
branch_volume
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + mpa + start_temp
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + lfm +
leaf_mass_ratio + start_temp
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + lfm +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + lfm +
leaf_mass_ratio + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + lfm + mpa +
thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + lfm + dmc +
thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + sample_wt + dmc +
branch_volume
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + sample_wt + dmc +
thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + leaf_mass_ratio +
mpa + start_temp
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + leaf_mass_ratio +
start_temp + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + mpa + start_temp +
thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + start_temp +
branch_volume + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + dmc +
branch_volume + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + lfm + sample_wt +
leaf_mass_ratio + dmc
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + lfm + sample_wt +
mpa + stem_sav
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + lfm +
leaf_mass_ratio + mpa + start_temp
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + lfm + branching +
```

```
mpa + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + lfm + branching +
start_temp + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + lfm + branching +
branch_volume + stem_sav
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + sample_wt +
leaf_mass_ratio + mpa + start_temp
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + sample_wt +
branching + dmc + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + sample_wt + mpa +
dmc + branch_volume
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + sample_wt + mpa +
dmc + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + sample_wt + mpa +
stem_sav + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + sample_wt +
start_temp + dmc + branch_volume
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + sample_wt + dmc +
branch_volume + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + leaf_mass_ratio +
branching + mpa + dmc
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + leaf_mass_ratio +
branching + mpa + branch_volume
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + leaf_mass_ratio +
branching + mpa + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + leaf_mass_ratio +
mpa + start_temp + stem_sav
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + branching + mpa +
branch_volume + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + branching + mpa +
stem_sav + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + branching +
start_temp + dmc + branch_volume
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + branching +
start_temp + dmc + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + branching +
start_temp + branch_volume + thickness
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + branching + dmc +
branch_volume + stem_sav
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + mpa + dmc +
branch_volume + stem_sav
ERROR: Formula model error: fd ~ LMA*leaf_sav + LMA*species + start_temp + dmc +
branch_volume + thickness
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + sample_wt +
leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + start_temp +
leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + lfm + sample_wt +
```

```
branching
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + lfm + mpa + dmc
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + sample_wt +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + sample_wt + mpa +
dmc
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + sample_wt + mpa +
stem_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + sample_wt +
start_temp + leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + sample_wt + dmc +
stem_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + branching +
branch_volume + stem_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + lfm + sample_wt +
dmc + branch_volume
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + lfm +
leaf_mass_ratio + mpa + leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + lfm +
leaf_mass_ratio + dmc + stem_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + lfm +
leaf_mass_ratio + stem_sav + leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + lfm + branching +
mpa + branch_volume
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + lfm + branching +
branch_volume + leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + lfm + mpa +
start_temp + stem_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + lfm + start_temp
+ stem_sav + leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + sample_wt +
leaf_mass_ratio + mpa + leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + sample_wt +
leaf_mass_ratio + dmc + leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + sample_wt +
branching + dmc + leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + sample_wt +
branching + branch_volume + leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + sample_wt +
start_temp + branch_volume + leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + sample_wt + dmc +
branch_volume + leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + leaf_mass_ratio +
start_temp + dmc + stem_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + leaf_mass_ratio +
start_temp + dmc + leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + branching +
start_temp + dmc + branch_volume
```

```
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + branching +
start_temp + stem_sav + leaf_sav
ERROR: Formula model error: fd ~ LMA*thickness + LMA*species + start_temp + dmc
+ branch_volume + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + lfm
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + leaf_mass_ratio
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + lfm +
leaf_mass_ratio
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + lfm +
branch_volume
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + leaf_mass_ratio +
leaf_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + branching +
stem_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + stem_sav +
leaf_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + leaf_mass_ratio +
mpa + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + branching + mpa +
stem_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + branching +
start_temp + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + mpa + start_temp
+ branch_volume
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + mpa + stem_sav +
leaf_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + lfm + branching +
leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + leaf_mass_ratio +
branching + mpa + start_temp
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + leaf_mass_ratio +
mpa + start_temp + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + leaf_mass_ratio +
mpa + start_temp + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + leaf_mass_ratio +
start_temp + branch_volume + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + branching + mpa +
start_temp + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + branching + mpa +
branch_volume + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt*dmc + start_temp +
stem_sav + leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav +
leaf_mass_ratio + mpa
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav +
leaf_mass_ratio + start_temp
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav +
leaf_mass_ratio + stem_sav
```

```
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + branching +
thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + mpa +
thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + dmc +
branch_volume
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + lfm +
branching + branch_volume
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + lfm +
branching + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + lfm +
branch_volume + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav +
leaf_mass_ratio + branching + stem_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav +
leaf_mass_ratio + mpa + dmc
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav +
leaf_mass_ratio + dmc + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + branching +
mpa + dmc
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + branching +
mpa + branch_volume
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + dmc +
branch_volume + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + lfm +
leaf_mass_ratio + start_temp + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + lfm +
leaf_mass_ratio + branch_volume + stem_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + lfm +
branching + start_temp + branch_volume
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav +
leaf_mass_ratio + branching + mpa + start_temp
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav +
leaf_mass_ratio + mpa + start_temp + stem_sav
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav +
leaf_mass_ratio + mpa + branch_volume + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + branching +
start_temp + dmc + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + branching +
start_temp + stem_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*leaf_sav + branching +
branch_volume + stem_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*species + lfm +
branch_volume + thickness
ERROR: Formula model error: fd ~ LMA*species + sample_wt*species + start_temp +
dmc + branch_volume + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + thickness
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + sample_wt +
```

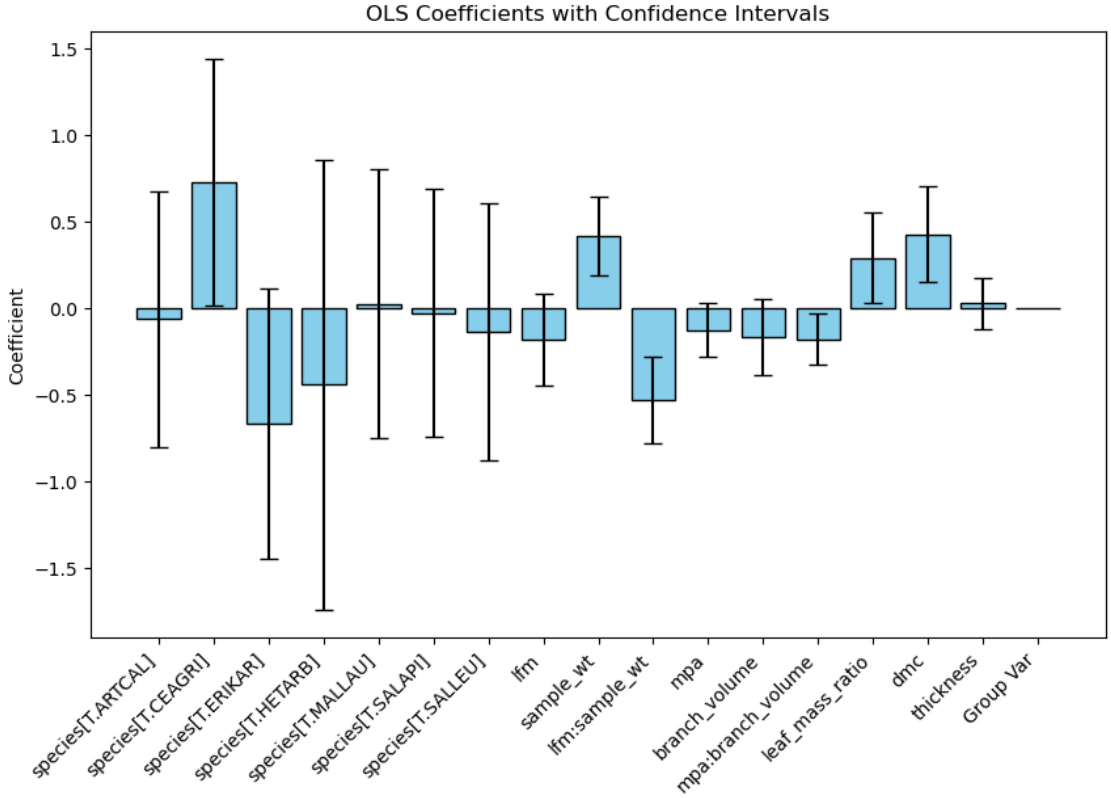
```
start_temp
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + mpa +
start_temp
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + start_temp
+ stem_sav
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + lfm +
branch_volume + stem_sav
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + sample_wt +
branching + mpa
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + sample_wt +
start_temp + stem_sav
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + sample_wt +
start_temp + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + branching +
mpa + stem_sav
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + branching +
stem_sav + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + branching +
leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + lfm +
sample_wt + branching + start_temp
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + lfm +
sample_wt + mpa + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + lfm +
sample_wt + branch_volume + thickness
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + lfm +
stem_sav + leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + sample_wt +
mpa + start_temp + stem_sav
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + sample_wt +
mpa + stem_sav + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + sample_wt +
start_temp + leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + branching +
mpa + branch_volume + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + leaf_mass_ratio*dmc + start_temp
+ branch_volume + leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + branching*stem_sav + lfm +
start_temp
ERROR: Formula model error: fd ~ LMA*species + branching*stem_sav + lfm +
thickness
ERROR: Formula model error: fd ~ LMA*species + branching*stem_sav + sample_wt +
leaf_sav
ERROR: Formula model error: fd ~ LMA*species + branching*stem_sav + lfm +
sample_wt + branch_volume
ERROR: Formula model error: fd ~ LMA*species + branching*stem_sav + lfm +
leaf_mass_ratio + branch_volume
ERROR: Formula model error: fd ~ LMA*species + branching*stem_sav + sample_wt +
```

```
leaf_mass_ratio + start_temp
ERROR: Formula model error: fd ~ LMA*species + branching*stem_sav + sample_wt +
mpa + start_temp
ERROR: Formula model error: fd ~ LMA*species + branching*stem_sav + dmc +
leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + branching*stem_sav + lfm +
sample_wt + leaf_mass_ratio + thickness
ERROR: Formula model error: fd ~ LMA*species + branching*stem_sav + lfm + mpa +
dmc + thickness
ERROR: Formula model error: fd ~ LMA*species + branching*stem_sav + sample_wt +
start_temp + leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + branching*stem_sav + mpa +
start_temp + leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + branching*stem_sav + start_temp +
dmc + branch_volume + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume +
leaf_mass_ratio
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume +
leaf_mass_ratio + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + branching +
dmc
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + start_temp +
dmc
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + lfm +
sample_wt + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + sample_wt +
leaf_mass_ratio + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + sample_wt +
branching + start_temp
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + sample_wt +
start_temp + thickness
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume +
leaf_mass_ratio + leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + start_temp +
dmc + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + start_temp +
dmc + thickness
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + lfm +
sample_wt + leaf_mass_ratio + thickness
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + lfm +
sample_wt + branching + dmc
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + lfm +
sample_wt + branching + stem_sav
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + lfm +
sample_wt + dmc + thickness
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + lfm +
branching + start_temp + stem_sav
```

```
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + lfm +
branching + start_temp + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + lfm +
branching + stem_sav + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + sample_wt +
leaf_mass_ratio + dmc + thickness
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + sample_wt +
start_temp + leaf_sav + thickness
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume +
leaf_mass_ratio + branching + start_temp + dmc
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume +
leaf_mass_ratio + start_temp + dmc + leaf_sav
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + branching +
start_temp + dmc + stem_sav
ERROR: Formula model error: fd ~ LMA*species + mpa*branch_volume + branching +
start_temp + dmc + leaf_sav


fd ~ lfm*sample_wt + mpa*branch_volume + leaf_mass_ratio + dmc + thickness +
species
fd ~ lfm*sample_wt + mpa*branch_volume + leaf_mass_ratio + start_temp + dmc +
species
fd ~ lfm*sample_wt + mpa*branch_volume + leaf_mass_ratio + branching + dmc +
species
fd ~ lfm*sample_wt + mpa*branch_volume + leaf_mass_ratio + dmc + leaf_sav +
species
fd ~ lfm*sample_wt + mpa*branch_volume + LMA + dmc + species
fd ~ lfm*leaf_mass_ratio + sample_wt*dmc + species
fd ~ lfm*sample_wt + mpa*branch_volume + dmc
fd ~ lfm*leaf_mass_ratio + sample_wt*dmc + mpa + species
fd ~ lfm*sample_wt + mpa*branch_volume + LMA + leaf_mass_ratio + dmc + species
fd ~ lfm*sample_wt + mpa*branch_volume + LMA + dmc + stem_sav + species
fd ~ lfm*sample_wt + dmc + branch_volume
fd ~ lfm*sample_wt + dmc
fd ~ lfm*sample_wt + mpa*branch_volume + leaf_mass_ratio + dmc + species
fd ~ lfm*leaf_mass_ratio + sample_wt*dmc + LMA + species
fd ~ lfm*sample_wt + mpa*branch_volume + leaf_mass_ratio + dmc + stem_sav
fd ~ lfm*sample_wt + mpa*branch_volume + stem_sav
fd ~ lfm*sample_wt + mpa*branch_volume + leaf_mass_ratio + dmc + stem_sav +
species
fd ~ lfm*sample_wt + mpa*branch_volume + branching + dmc
fd ~ lfm*sample_wt + mpa*branch_volume + dmc + species
fd ~ lfm*sample_wt + mpa*branch_volume + dmc + stem_sav
fd ~ lfm*sample_wt + mpa*branch_volume + start_temp + dmc
fd ~ lfm*sample_wt + sample_wt*dmc + leaf_mass_ratio + branch_volume + species
fd ~ lfm*sample_wt + start_temp + dmc + branch_volume
fd ~ lfm*sample_wt + sample_wt*dmc + leaf_mass_ratio + species
fd ~ lfm*sample_wt + leaf_mass_ratio + dmc + branch_volume + stem_sav
```

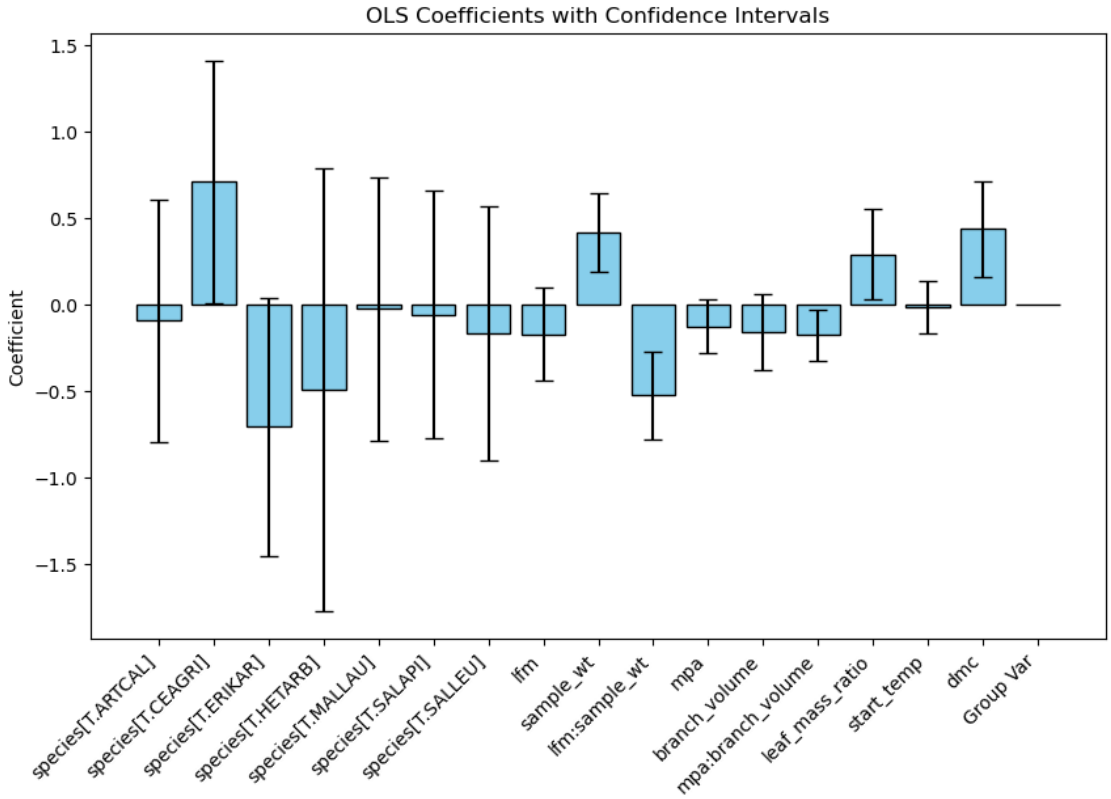
```
fd ~ lfm*sample_wt + mpa*branch_volume + dmc + stem_sav + species
fd ~ lfm*sample_wt + sample_wt*dmc + leaf_mass_ratio + mpa + branch_volume +
species
fd ~ lfm*sample_wt + leaf_mass_ratio + dmc + branch_volume + species
fd ~ lfm*sample_wt + sample_wt*dmc + LMA + leaf_mass_ratio + species
fd ~ lfm*sample_wt + leaf_mass_ratio + dmc + species
fd ~ lfm*sample_wt + leaf_mass_ratio + dmc + branch_volume
fd ~ lfm*sample_wt + mpa*branch_volume + dmc + leaf_sav
fd ~ lfm*sample_wt + sample_wt*dmc + LMA + leaf_mass_ratio + branch_volume +
species
fd ~ lfm*leaf_mass_ratio + sample_wt*dmc + stem_sav + species
fd ~ lfm*sample_wt + mpa*branch_volume + LMA + dmc
fd ~ lfm*sample_wt + mpa*branch_volume + leaf_mass_ratio + dmc
fd ~ sample_wt*dmc + sample_wt*leaf_sav + leaf_mass_ratio + species
fd ~ lfm*sample_wt + start_temp + dmc
fd ~ lfm*sample_wt + branching + dmc
fd ~ lfm*sample_wt + leaf_mass_ratio + dmc
fd ~ lfm*sample_wt + LMA + leaf_mass_ratio + dmc + species
fd ~ lfm*sample_wt + dmc + branch_volume + stem_sav
fd ~ lfm*sample_wt + branching + dmc + branch_volume
fd ~ lfm*sample_wt + mpa*branch_volume + start_temp + dmc + stem_sav
fd ~ lfm*sample_wt + sample_wt*dmc + LMA + leaf_mass_ratio + mpa + species
fd ~ lfm*sample_wt + sample_wt*dmc + leaf_mass_ratio + mpa + species
fd ~ lfm*sample_wt + sample_wt*dmc + leaf_mass_ratio + branch_volume + stem_sav
+ species
fd ~ lfm*sample_wt + leaf_mass_ratio + mpa + dmc + species
fd ~ lfm*sample_wt + mpa*branch_volume + leaf_mass_ratio + branching + dmc
fd ~ lfm*sample_wt + LMA + dmc + branch_volume
fd ~ lfm*sample_wt + dmc + leaf_sav
fd ~ lfm*sample_wt + mpa*branch_volume + branching + start_temp + dmc
fd ~ lfm*sample_wt + leaf_mass_ratio + dmc + stem_sav
fd ~ lfm*leaf_mass_ratio + sample_wt*dmc + branch_volume + species


           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5443
Min. group size:     1        Log-Likelihood:      -180.8499
Max. group size:     11       Converged:           Yes
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept         -0.068    0.297 -0.228 0.819 -0.650  0.515
species[T.ARTCAL] -0.062    0.377 -0.165 0.869 -0.802  0.677
species[T.CEAGRI]  0.728    0.364  1.999 0.046  0.014  1.442
```

```
species[T.ERIKAR] -0.667    0.399 -1.672 0.094 -1.449  0.115
species[T.HETARB] -0.441    0.662 -0.666 0.506 -1.738  0.857
species[T.MALLAU]  0.027    0.397  0.067 0.946 -0.751  0.804
species[T.SALAPI] -0.028    0.365 -0.076 0.939 -0.744  0.689
species[T.SALLEU] -0.138    0.378 -0.365 0.715 -0.879  0.603
lfm               -0.178    0.135 -1.315 0.189 -0.443  0.087
sample_wt          0.415    0.115  3.593 0.000  0.188  0.641
lfm:sample_wt     -0.532    0.127 -4.176 0.000 -0.782 -0.282
mpa               -0.126    0.079 -1.601 0.109 -0.280  0.028
branch_volume     -0.164    0.112 -1.466 0.143 -0.384  0.055
mpa:branch_volume -0.177    0.076 -2.319 0.020 -0.327 -0.027
leaf_mass_ratio    0.289    0.133  2.175 0.030  0.029  0.550
dmc                0.428    0.142  3.008 0.003  0.149  0.706
thickness          0.029    0.075  0.383 0.702 -0.118  0.175
Group Var          0.002
============================================================
```




```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
```

```
No. Groups:          54       Scale:               0.5450
Min. group size:     1        Log-Likelihood:      -180.8669
Max. group size:     11       Converged:           Yes
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept         -0.033    0.284 -0.116 0.908 -0.589  0.523
species[T.ARTCAL] -0.096    0.357 -0.267 0.789 -0.796  0.605
species[T.CEAGRI]  0.710    0.358  1.986 0.047  0.009  1.412
species[T.ERIKAR] -0.710    0.380 -1.867 0.062 -1.455  0.035
species[T.HETARB] -0.492    0.653 -0.754 0.451 -1.773  0.788
species[T.MALLAU] -0.028    0.390 -0.071 0.944 -0.791  0.736
species[T.SALAPI] -0.062    0.366 -0.168 0.866 -0.778  0.655
species[T.SALLEU] -0.168    0.376 -0.448 0.654 -0.905  0.568
lfm               -0.173    0.137 -1.267 0.205 -0.441  0.095
sample_wt          0.414    0.115  3.592 0.000  0.188  0.639
lfm:sample_wt     -0.528    0.129 -4.101 0.000 -0.780 -0.275
mpa               -0.128    0.080 -1.590 0.112 -0.285  0.030
branch_volume     -0.162    0.113 -1.439 0.150 -0.384  0.059
mpa:branch_volume -0.178    0.077 -2.329 0.020 -0.328 -0.028
leaf_mass_ratio    0.290    0.134  2.168 0.030  0.028  0.551
start_temp        -0.020    0.077 -0.259 0.796 -0.172  0.131
dmc                0.436    0.142  3.069 0.002  0.157  0.714
Group Var          0.001
============================================================
```

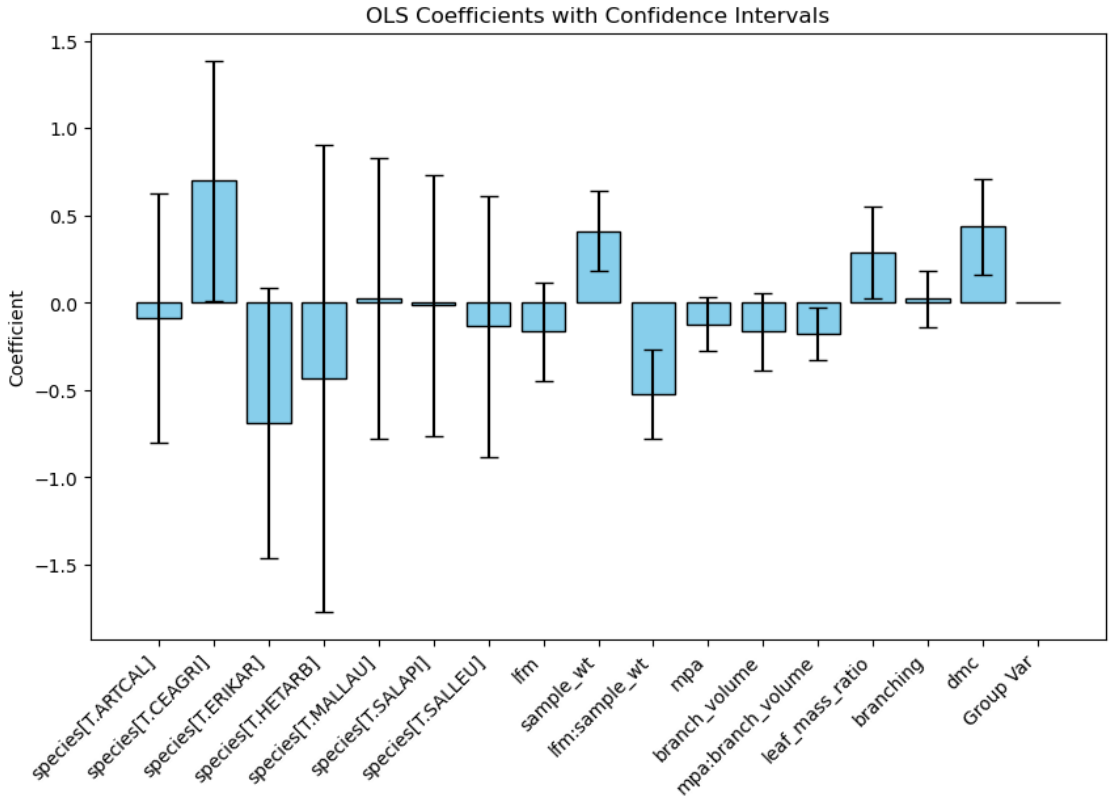


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.5448
Min. group size:	1	Log-Likelihood:	-180.8769
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

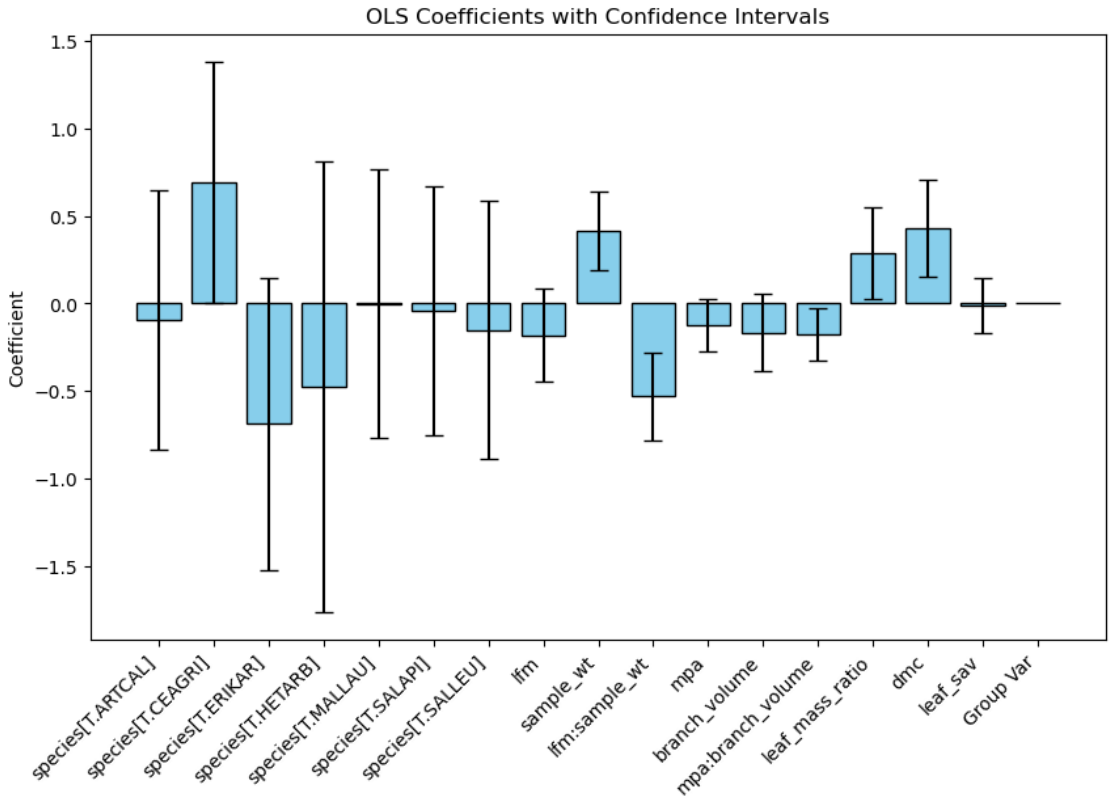
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.058	0.298	-0.194	0.846	-0.643	0.527
species[T.ARTCAL]	-0.090	0.365	-0.247	0.805	-0.805	0.625
species[T.CEAGRI]	0.700	0.351	1.995	0.046	0.012	1.387
species[T.ERIKAR]	-0.686	0.395	-1.737	0.082	-1.460	0.088
species[T.HETARB]	-0.432	0.682	-0.633	0.527	-1.768	0.905
species[T.MALLAU]	0.026	0.410	0.065	0.949	-0.776	0.829
species[T.SALAPI]	-0.016	0.381	-0.041	0.967	-0.762	0.730
species[T.SALLEU]	-0.134	0.382	-0.352	0.725	-0.882	0.614
lfm	-0.167	0.144	-1.159	0.246	-0.449	0.115
sample_wt	0.411	0.116	3.548	0.000	0.184	0.637
lfm:sample_wt	-0.525	0.130	-4.038	0.000	-0.780	-0.270

```
mpa                -0.124    0.078 -1.594 0.111 -0.277  0.029
branch_volume      -0.165    0.112 -1.472 0.141 -0.385  0.055
mpa:branch_volume  -0.179    0.077 -2.329 0.020 -0.330 -0.028
leaf_mass_ratio     0.290    0.134  2.165 0.030  0.027  0.552
branching           0.021    0.083  0.255 0.799 -0.142  0.185
dmc                 0.435    0.141  3.080 0.002  0.158  0.712
Group Var           0.001
============================================================
```




```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5447
Min. group size:     1        Log-Likelihood:      -180.9108
Max. group size:     11       Converged:           Yes
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept         -0.046    0.297 -0.155 0.877 -0.628  0.535
```

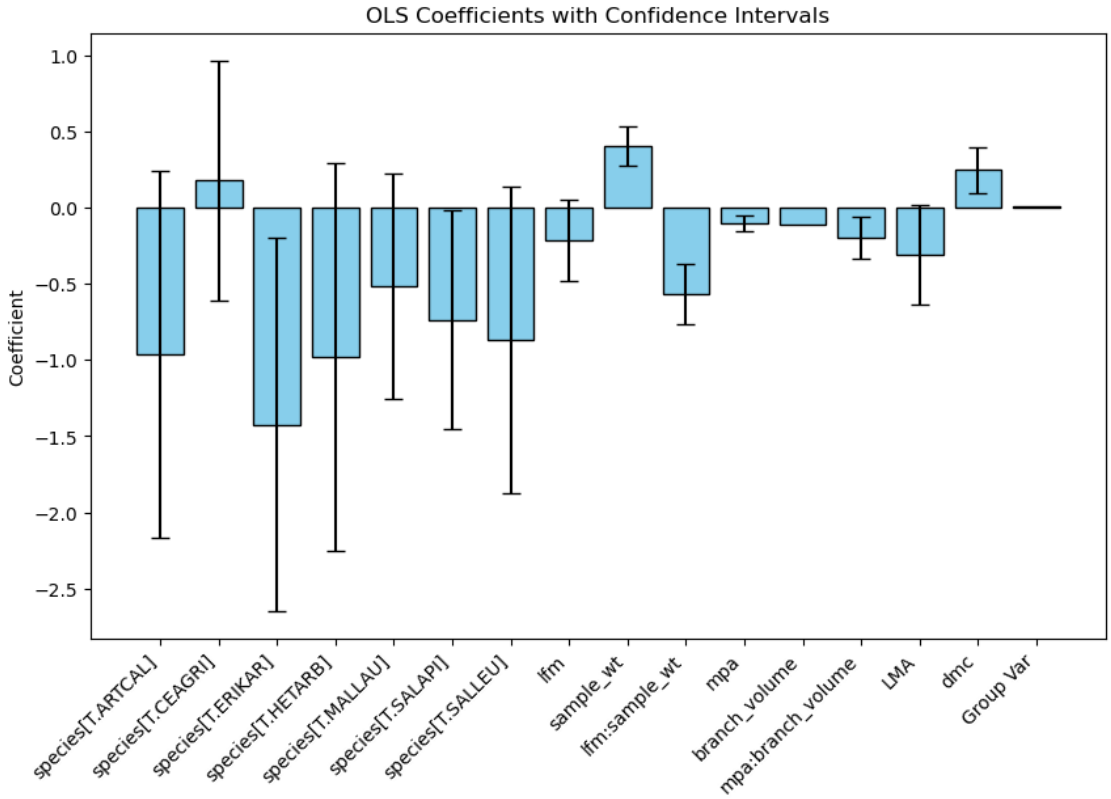
```
species[T.ARTCAL] -0.094    0.380 -0.248 0.804 -0.838  0.650
species[T.CEAGRI]  0.695    0.352  1.975 0.048  0.005  1.385
species[T.ERIKAR] -0.686    0.426 -1.611 0.107 -1.521  0.149
species[T.HETARB] -0.473    0.657 -0.720 0.472 -1.762  0.815
species[T.MALLAU] -0.002    0.391 -0.005 0.996 -0.768  0.764
species[T.SALAPI] -0.043    0.364 -0.118 0.906 -0.757  0.671
species[T.SALLEU] -0.150    0.377 -0.399 0.690 -0.889  0.588
lfm               -0.182    0.137 -1.327 0.185 -0.450  0.087
sample_wt          0.414    0.115  3.599 0.000  0.189  0.640
lfm:sample_wt     -0.531    0.128 -4.147 0.000 -0.781 -0.280
mpa               -0.123    0.078 -1.582 0.114 -0.276  0.029
branch_volume     -0.166    0.112 -1.478 0.139 -0.385  0.054
mpa:branch_volume -0.178    0.077 -2.321 0.020 -0.328 -0.028
leaf_mass_ratio    0.287    0.133  2.154 0.031  0.026  0.549
dmc                0.432    0.141  3.055 0.002  0.155  0.709
leaf_sav          -0.011    0.079 -0.142 0.887 -0.166  0.143
Group Var          0.002
============================================================
```




```
           Mixed Linear Model Regression Results
============================================================
```

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.5484
Min. group size:	1	Log-Likelihood:	-181.9757
Max. group size:	11	Converged:	No
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.557	0.413	1.346	0.178	-0.254	1.367
species[T.ARTCAL]	-0.964	0.615	-1.568	0.117	-2.170	0.241
species[T.CEAGRI]	0.180	0.402	0.447	0.655	-0.607	0.967
species[T.ERIKAR]	-1.424	0.623	-2.283	0.022	-2.646	-0.202
species[T.HETARB]	-0.979	0.651	-1.504	0.133	-2.255	0.297
species[T.MALLAU]	-0.518	0.378	-1.372	0.170	-1.258	0.222
species[T.SALAPI]	-0.736	0.366	-2.012	0.044	-1.454	-0.019
species[T.SALLEU]	-0.867	0.513	-1.691	0.091	-1.873	0.138
lfm	-0.218	0.136	-1.600	0.110	-0.484	0.049
sample_wt	0.405	0.066	6.141	0.000	0.276	0.535
lfm:sample_wt	-0.568	0.101	-5.607	0.000	-0.766	-0.369
mpa	-0.101	0.026	-3.884	0.000	-0.152	-0.050
branch_volume	-0.115					
mpa:branch_volume	-0.197	0.072	-2.758	0.006	-0.337	-0.057
LMA	-0.310	0.167	-1.852	0.064	-0.637	0.018
dmc	0.247	0.077	3.194	0.001	0.096	0.399
Group Var	0.005					

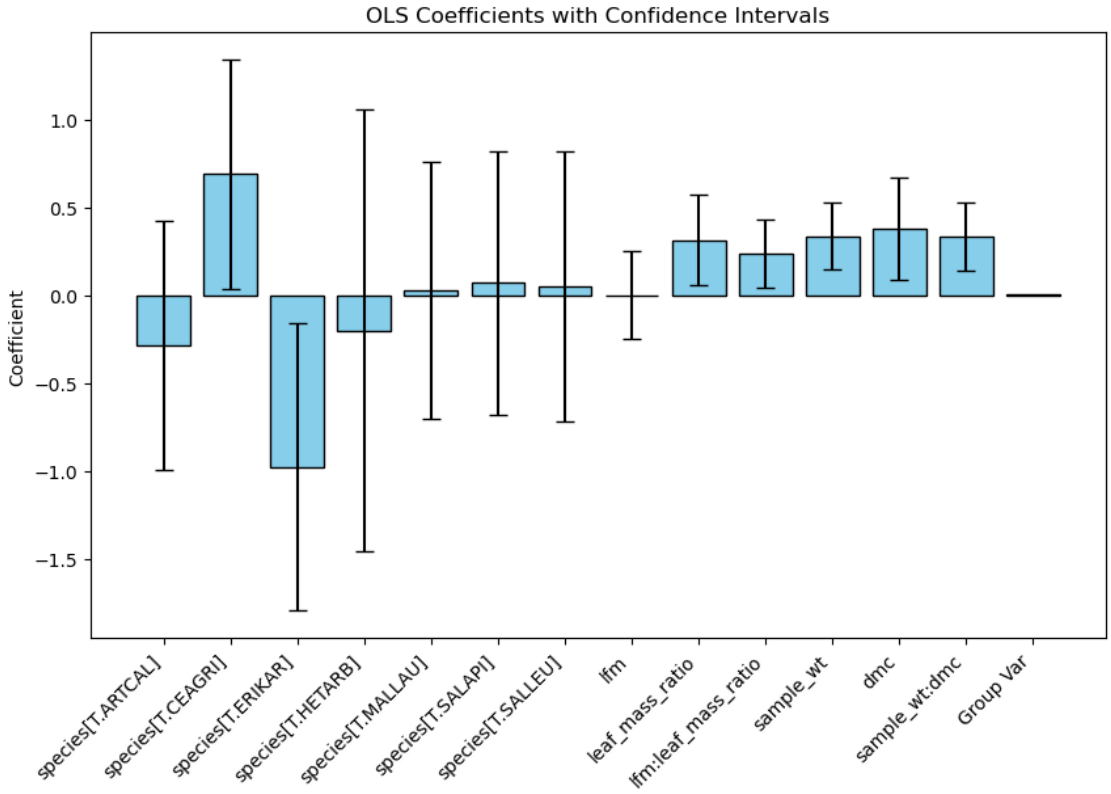


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.5657
Min. group size:	1	Log-Likelihood:	-183.9836
Max. group size:	11	Converged:	No
Mean group size:	3.0		

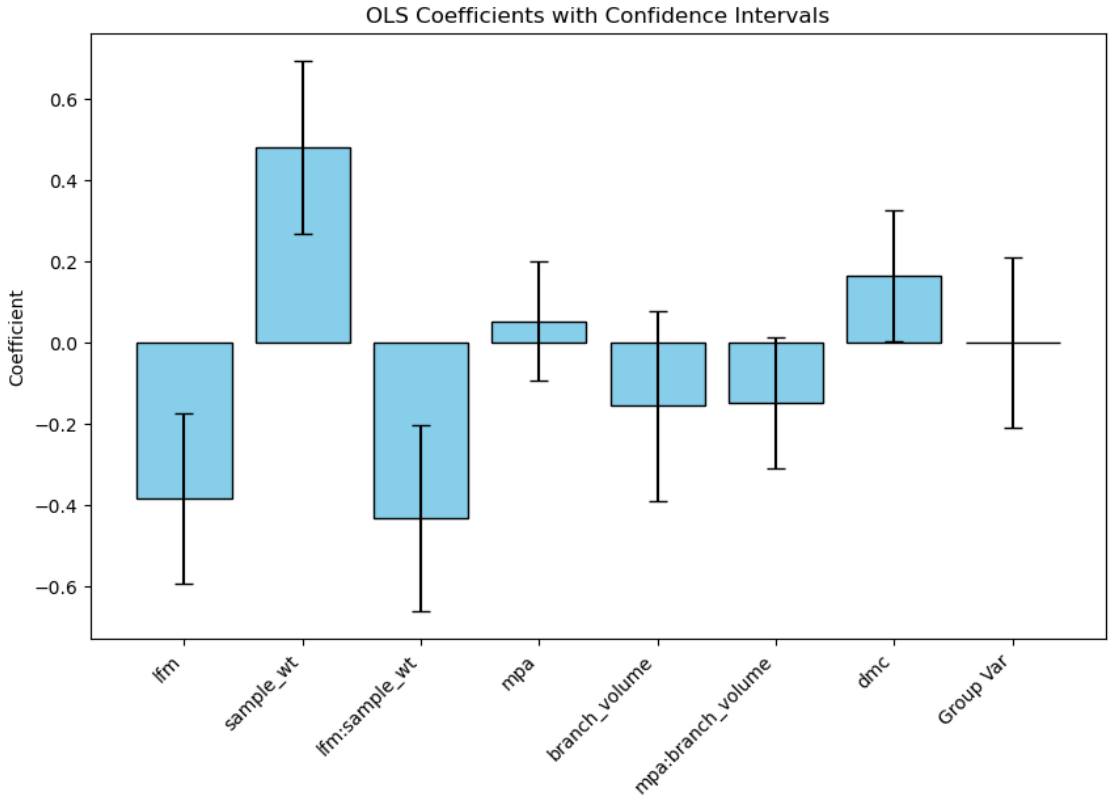
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.104	0.288	-0.361	0.718	-0.669	0.461
species[T.ARTCAL]	-0.287	0.363	-0.793	0.428	-0.998	0.423
species[T.CEAGRI]	0.687	0.332	2.072	0.038	0.037	1.338
species[T.ERIKAR]	-0.978	0.418	-2.341	0.019	-1.797	-0.159
species[T.HETARB]	-0.201	0.641	-0.313	0.754	-1.456	1.055
species[T.MALLAU]	0.026	0.372	0.068	0.945	-0.705	0.756
species[T.SALAPI]	0.071	0.382	0.185	0.853	-0.678	0.820
species[T.SALLEU]	0.047	0.392	0.121	0.904	-0.721	0.816
lfm	0.001	0.129	0.005	0.996	-0.252	0.253
leaf_mass_ratio	0.312	0.132	2.367	0.018	0.054	0.571
lfm:leaf_mass_ratio	0.237	0.100	2.375	0.018	0.041	0.432

```
sample_wt            0.336    0.098  3.410 0.001  0.143  0.529
dmc                  0.376    0.147  2.556 0.011  0.088  0.665
sample_wt:dmc        0.331    0.099  3.332 0.001  0.136  0.525
Group Var            0.002
============================================================
```



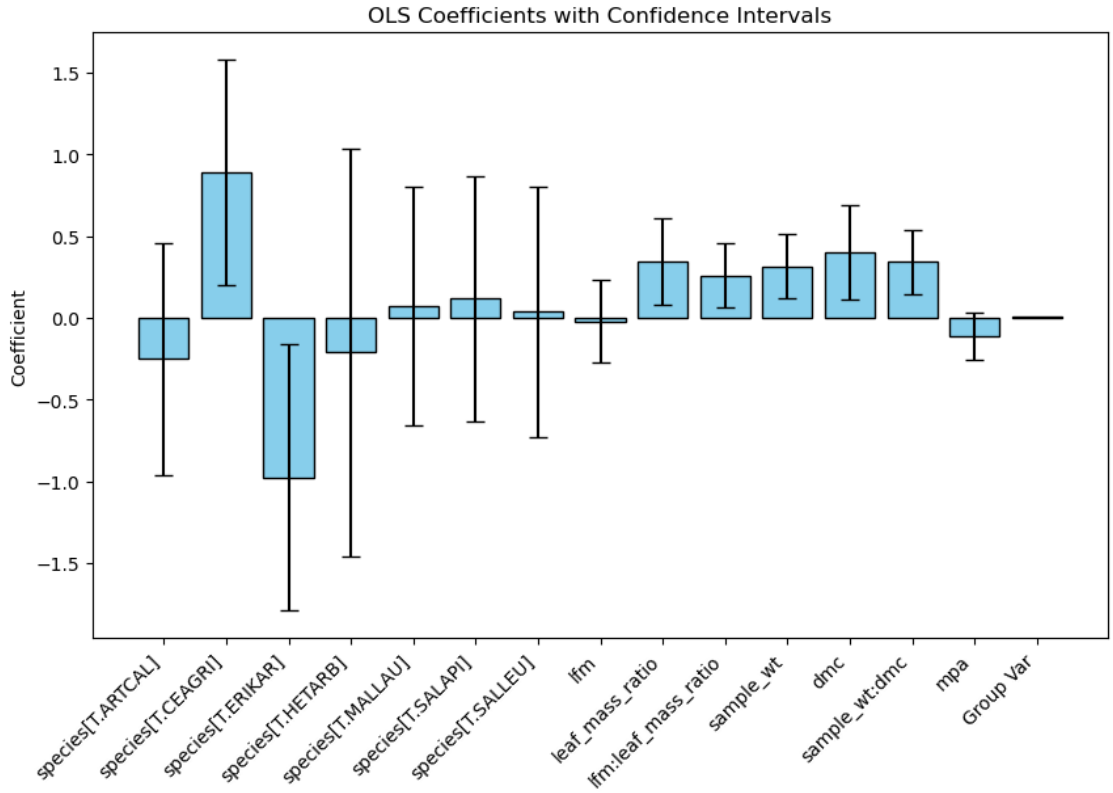

```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.6116
Min. group size:     1        Log-Likelihood:      -190.0375
Max. group size:     11       Converged:           Yes
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept         -0.093    0.069 -1.343 0.179 -0.229  0.043
lfm               -0.386    0.107 -3.606 0.000 -0.596 -0.176
sample_wt          0.480    0.109  4.400 0.000  0.266  0.694
lfm:sample_wt     -0.432    0.117 -3.695 0.000 -0.661 -0.203
```

```
mpa                 0.051    0.075  0.680 0.497 -0.096  0.197
branch_volume      -0.157    0.120 -1.314 0.189 -0.392  0.077
mpa:branch_volume  -0.149    0.082 -1.821 0.069 -0.310  0.011
dmc                 0.163    0.082  1.991 0.046  0.003  0.324
Group Var           0.000    0.084
============================================================
```



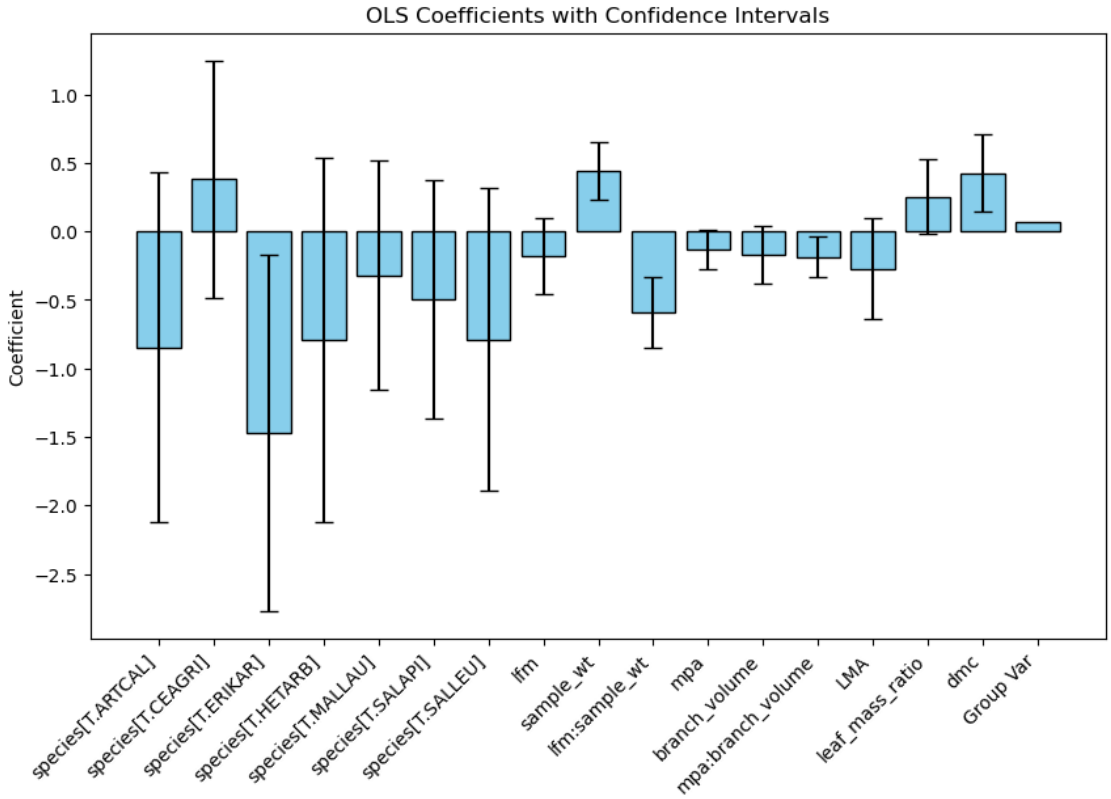

```
            Mixed Linear Model Regression Results
============================================================
Model:               MixedLM   Dependent Variable:   fd
No. Observations:    162       Method:               ML
No. Groups:          54        Scale:                0.5579
Min. group size:     1         Log-Likelihood:       -183.0882
Max. group size:     11        Converged:            Yes
Mean group size:     3.0
------------------------------------------------------------
                   Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept          -0.166    0.291 -0.570 0.568 -0.737  0.404
species[T.ARTCAL]  -0.253    0.360 -0.702 0.482 -0.959  0.453
species[T.CEAGRI]   0.886    0.352  2.519 0.012  0.197  1.576
```

```
species[T.ERIKAR]    -0.976    0.416 -2.343 0.019 -1.792 -0.160
species[T.HETARB]    -0.211    0.636 -0.332 0.740 -1.458  1.036
species[T.MALLAU]     0.070    0.373  0.189 0.850 -0.661  0.802
species[T.SALAPI]     0.117    0.382  0.306 0.760 -0.632  0.866
species[T.SALLEU]     0.036    0.391  0.092 0.926 -0.731  0.803
lfm                  -0.023    0.129 -0.177 0.860 -0.275  0.230
leaf_mass_ratio       0.344    0.134  2.569 0.010  0.082  0.606
lfm:leaf_mass_ratio   0.259    0.100  2.594 0.009  0.063  0.455
sample_wt             0.313    0.100  3.135 0.002  0.117  0.509
dmc                   0.397    0.147  2.698 0.007  0.109  0.685
sample_wt:dmc         0.341    0.099  3.457 0.001  0.147  0.534
mpa                  -0.112    0.074 -1.521 0.128 -0.257  0.032
Group Var             0.003
============================================================
```




```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5158
Min. group size:     1        Log-Likelihood:      -181.1081
```

```
Max. group size:     11       Converged:           No
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept          0.442    0.442  0.999 0.318 -0.425  1.309
species[T.ARTCAL] -0.845    0.654 -1.293 0.196 -2.127  0.436
species[T.CEAGRI]  0.381    0.443  0.860 0.390 -0.487  1.249
species[T.ERIKAR] -1.468    0.663 -2.213 0.027 -2.768 -0.168
species[T.HETARB] -0.793    0.678 -1.169 0.242 -2.122  0.536
species[T.MALLAU] -0.319    0.425 -0.751 0.453 -1.152  0.514
species[T.SALAPI] -0.497    0.444 -1.119 0.263 -1.367  0.373
species[T.SALLEU] -0.788    0.564 -1.397 0.162 -1.893  0.317
lfm               -0.179    0.141 -1.272 0.204 -0.454  0.097
sample_wt          0.441    0.109  4.055 0.000  0.228  0.654
lfm:sample_wt     -0.588    0.132 -4.456 0.000 -0.847 -0.330
mpa               -0.133    0.075 -1.767 0.077 -0.279  0.014
branch_volume     -0.169    0.107 -1.573 0.116 -0.379  0.041
mpa:branch_volume -0.186    0.075 -2.470 0.013 -0.334 -0.039
LMA               -0.271    0.189 -1.439 0.150 -0.641  0.098
leaf_mass_ratio    0.252    0.139  1.813 0.070 -0.020  0.524
dmc                0.426    0.144  2.961 0.003  0.144  0.708
Group Var          0.035
============================================================
```

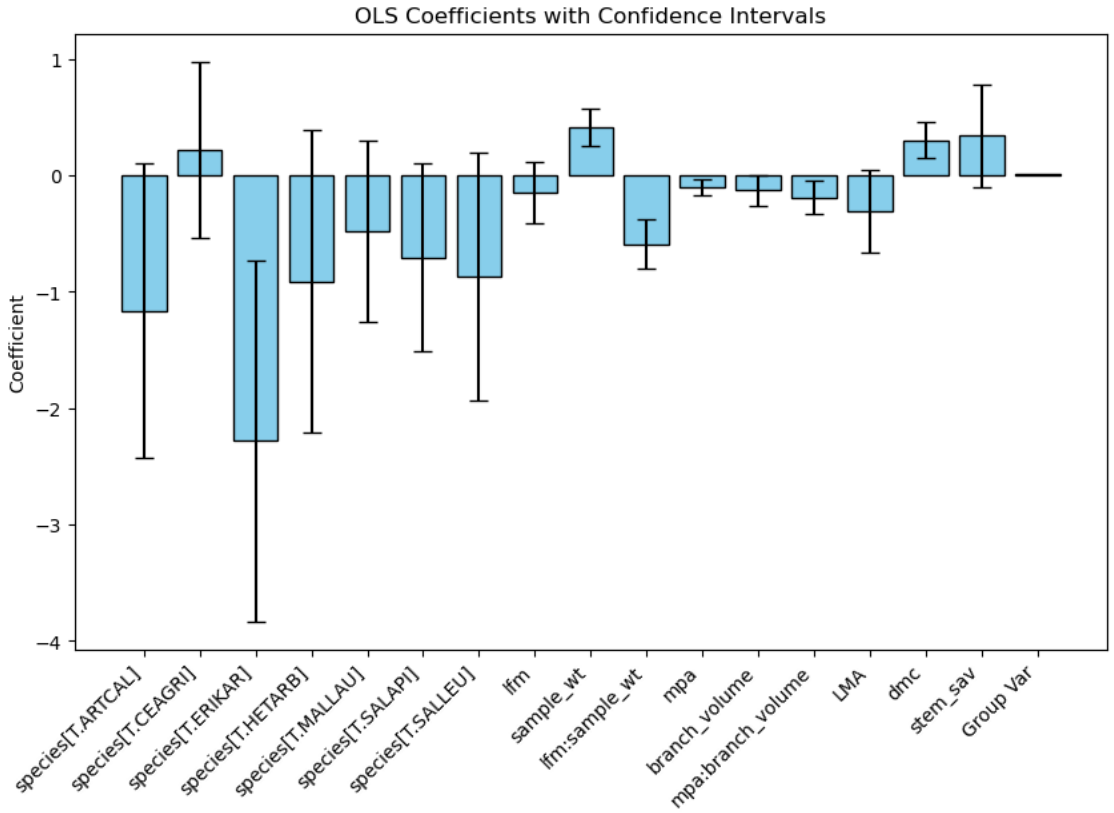


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.5430
Min. group size:	1	Log-Likelihood:	-181.1608
Max. group size:	11	Converged:	No
Mean group size:	3.0		

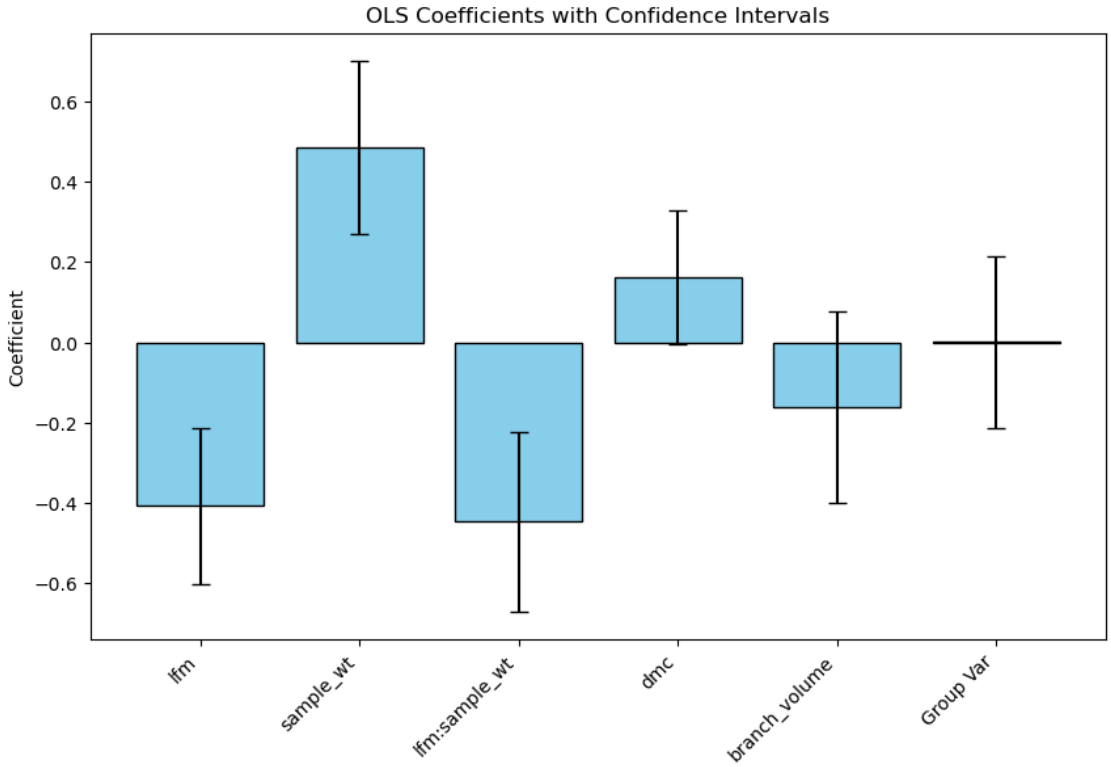
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.738	0.428	1.724	0.085	-0.101	1.577
species[T.ARTCAL]	-1.166	0.645	-1.806	0.071	-2.431	0.099
species[T.CEAGRI]	0.218	0.388	0.562	0.574	-0.543	0.979
species[T.ERIKAR]	-2.280	0.792	-2.880	0.004	-3.831	-0.728
species[T.HETARB]	-0.912	0.663	-1.375	0.169	-2.211	0.388
species[T.MALLAU]	-0.476	0.398	-1.197	0.231	-1.257	0.304
species[T.SALAPI]	-0.704	0.412	-1.708	0.088	-1.511	0.104
species[T.SALLEU]	-0.871	0.544	-1.602	0.109	-1.937	0.195
lfm	-0.147	0.136	-1.078	0.281	-0.414	0.120
sample_wt	0.414	0.084	4.924	0.000	0.249	0.579
lfm:sample_wt	-0.593	0.109	-5.460	0.000	-0.806	-0.380

```
mpa                -0.102    0.033 -3.135 0.002 -0.166 -0.038
branch_volume      -0.130    0.066 -1.980 0.048 -0.259 -0.001
mpa:branch_volume  -0.191    0.073 -2.635 0.008 -0.334 -0.049
LMA                -0.311    0.181 -1.718 0.086 -0.667  0.044
dmc                 0.302    0.078  3.876 0.000  0.149  0.455
stem_sav            0.339    0.223  1.523 0.128 -0.097  0.775
Group Var           0.005
============================================================
```



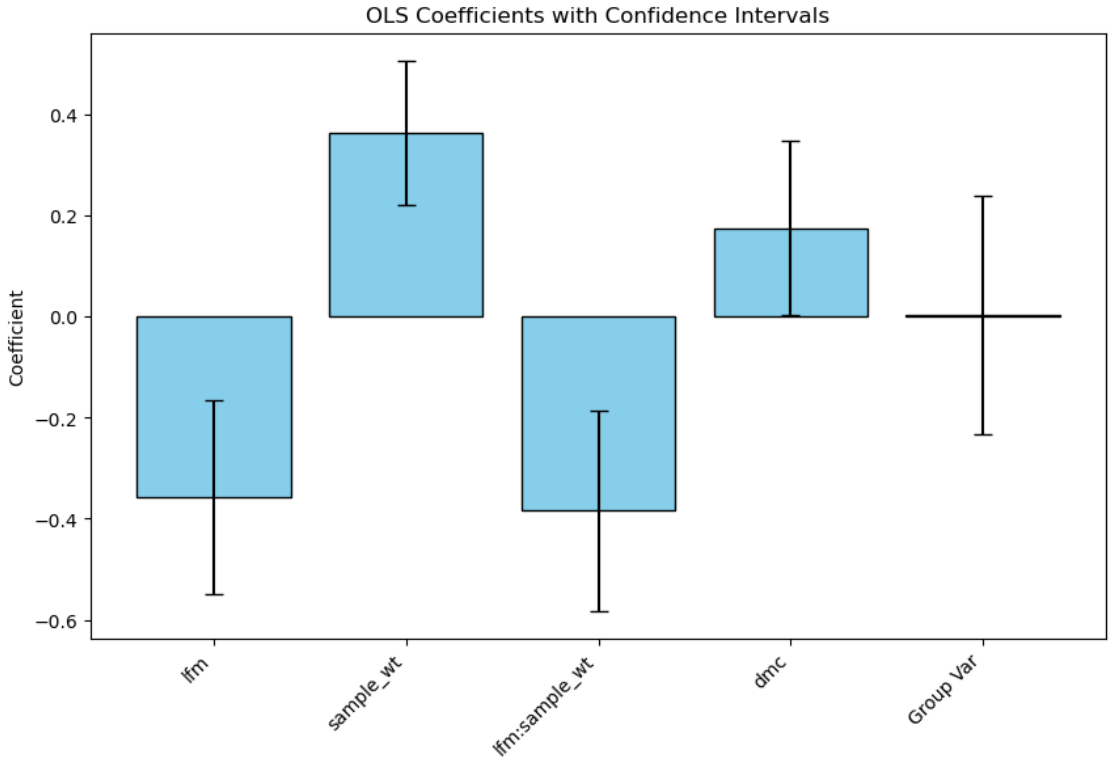

```
         Mixed Linear Model Regression Results
============================================================
Model:             MixedLM Dependent Variable: fd
No. Observations:  162     Method:             ML
No. Groups:        54      Scale:              0.6276
Min. group size:   1       Log-Likelihood:     -192.1855
Max. group size:   11      Converged:          No
Mean group size:   3.0
------------------------------------------------------------
              Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept     -0.089    0.069 -1.287 0.198 -0.224  0.046
```

```
lfm           -0.409    0.100 -4.099 0.000 -0.604 -0.213
sample_wt      0.486    0.110  4.403 0.000  0.270  0.703
lfm:sample_wt -0.448    0.114 -3.925 0.000 -0.672 -0.224
dmc            0.162    0.086  1.888 0.059 -0.006  0.330
branch_volume -0.163    0.122 -1.336 0.182 -0.402  0.076
Group Var      0.000    0.087
============================================================
```



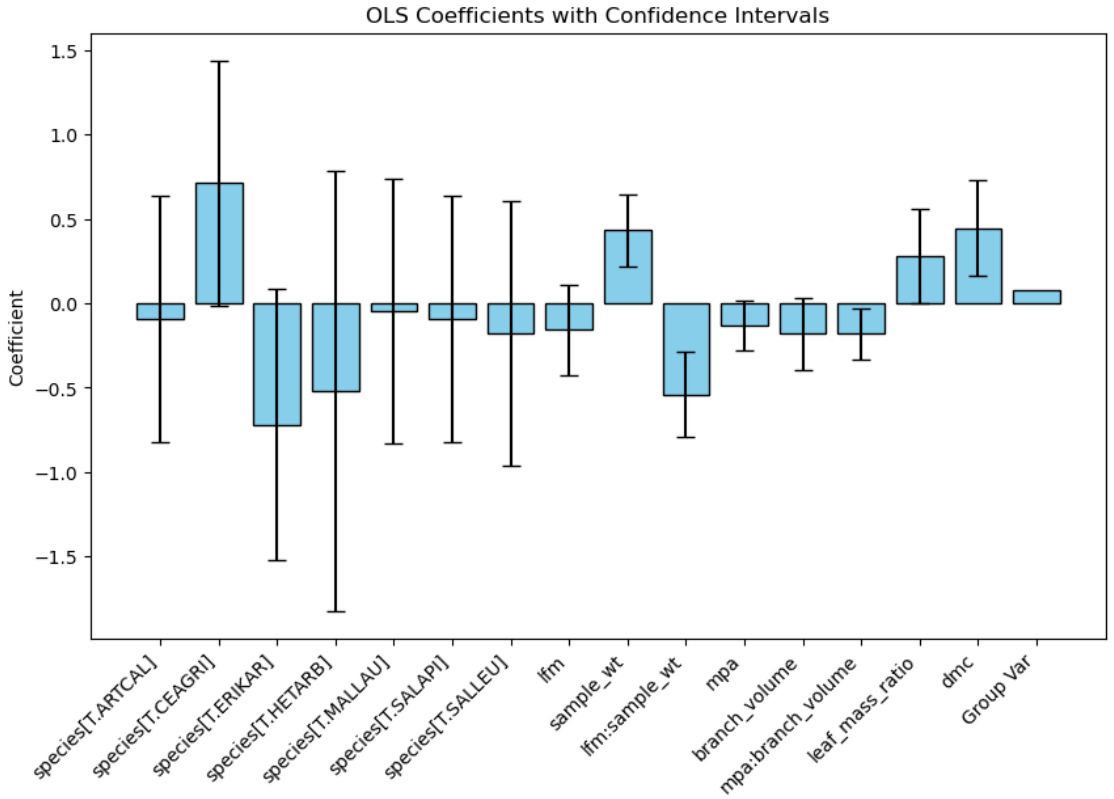

```
         Mixed Linear Model Regression Results
============================================================
Model:             MixedLM Dependent Variable: fd
No. Observations:  162     Method:             ML
No. Groups:        54      Scale:              0.6342
Min. group size:   1       Log-Likelihood:     -193.2160
Max. group size:   11      Converged:          No
Mean group size:   3.0
------------------------------------------------------------
              Coef.  Std.Err.    z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept     -0.074    0.068 -1.075 0.282 -0.208  0.061
lfm           -0.357    0.098 -3.645 0.000 -0.549 -0.165
sample_wt      0.364    0.073  5.008 0.000  0.222  0.507
```

```
lfm:sample_wt -0.384    0.101 -3.792 0.000 -0.582 -0.185
dmc            0.175    0.088  1.998 0.046  0.003  0.347
Group Var      0.002    0.096
=====================================================
```



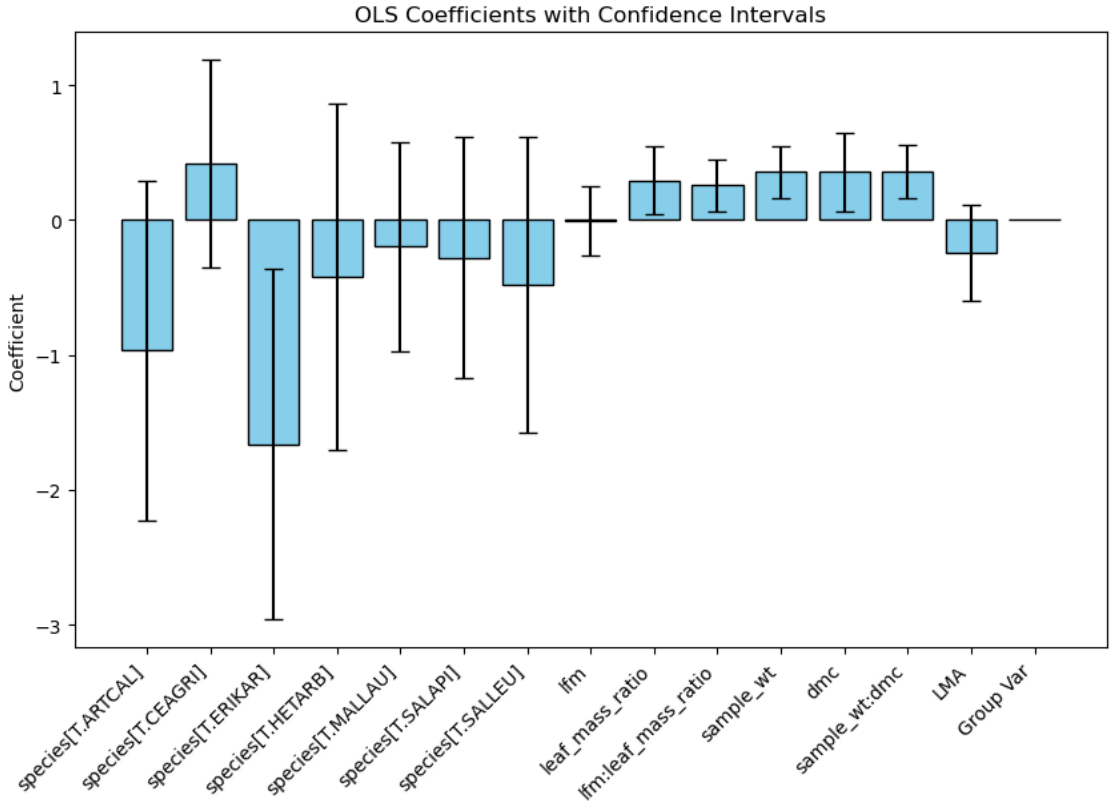

```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5188
Min. group size:     1        Log-Likelihood:      -182.2281
Max. group size:     11       Converged:           No
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept         -0.029    0.306 -0.094 0.925 -0.628  0.571
species[T.ARTCAL] -0.092    0.373 -0.247 0.805 -0.824  0.640
species[T.CEAGRI]  0.713    0.370  1.927 0.054 -0.012  1.439
species[T.ERIKAR] -0.720    0.410 -1.754 0.079 -1.524  0.084
species[T.HETARB] -0.519    0.665 -0.781 0.435 -1.822  0.784
species[T.MALLAU] -0.046    0.399 -0.115 0.908 -0.828  0.736
```

```
species[T.SALAPI] -0.093    0.372 -0.250 0.803 -0.822  0.636
species[T.SALLEU] -0.179    0.402 -0.445 0.656 -0.966  0.609
lfm               -0.159    0.136 -1.174 0.240 -0.425  0.107
sample_wt          0.433    0.108  4.001 0.000  0.221  0.645
lfm:sample_wt     -0.540    0.130 -4.146 0.000 -0.796 -0.285
mpa               -0.134    0.075 -1.787 0.074 -0.280  0.013
branch_volume     -0.182    0.108 -1.687 0.092 -0.393  0.029
mpa:branch_volume -0.182    0.077 -2.374 0.018 -0.332 -0.032
leaf_mass_ratio    0.281    0.142  1.976 0.048  0.002  0.559
dmc                0.446    0.145  3.077 0.002  0.162  0.730
Group Var          0.041
============================================================
```




```
            Mixed Linear Model Regression Results
============================================================
Model:               MixedLM   Dependent Variable:   fd
No. Observations:    162       Method:               ML
No. Groups:          54        Scale:                0.5592
Min. group size:     1         Log-Likelihood:       -183.2494
Max. group size:     11        Converged:            No
Mean group size:     3.0
```

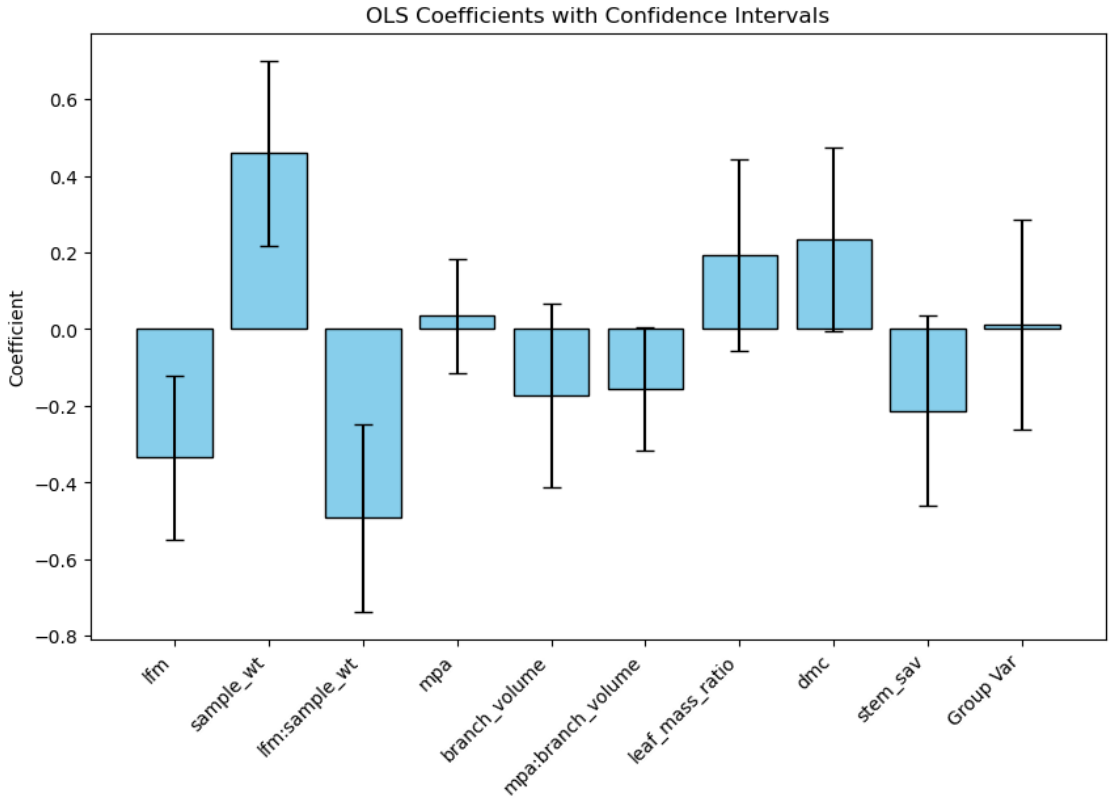
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.298	0.419	0.712	0.476	-0.523	1.119
species[T.ARTCAL]	-0.968	0.641	-1.511	0.131	-2.224	0.287
species[T.CEAGRI]	0.418	0.392	1.068	0.285	-0.349	1.186
species[T.ERIKAR]	-1.662	0.664	-2.504	0.012	-2.963	-0.361
species[T.HETARB]	-0.420	0.655	-0.641	0.521	-1.704	0.864
species[T.MALLAU]	-0.198	0.398	-0.498	0.618	-0.978	0.581
species[T.SALAPI]	-0.279	0.455	-0.612	0.540	-1.170	0.613
species[T.SALLEU]	-0.477	0.559	-0.852	0.394	-1.573	0.620
lfm	-0.005	0.130	-0.035	0.972	-0.260	0.251
leaf_mass_ratio	0.295	0.131	2.260	0.024	0.039	0.552
lfm:leaf_mass_ratio	0.258	0.099	2.594	0.009	0.063	0.453
sample_wt	0.355	0.099	3.600	0.000	0.162	0.549
dmc	0.356	0.148	2.406	0.016	0.066	0.646
sample_wt:dmc	0.358	0.100	3.572	0.000	0.162	0.554
LMA	-0.241	0.183	-1.322	0.186	-0.599	0.117
Group Var	0.003					



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.5907
Min. group size:	1	Log-Likelihood:	-188.2654
Max. group size:	11	Converged:	No
Mean group size:	3.0		

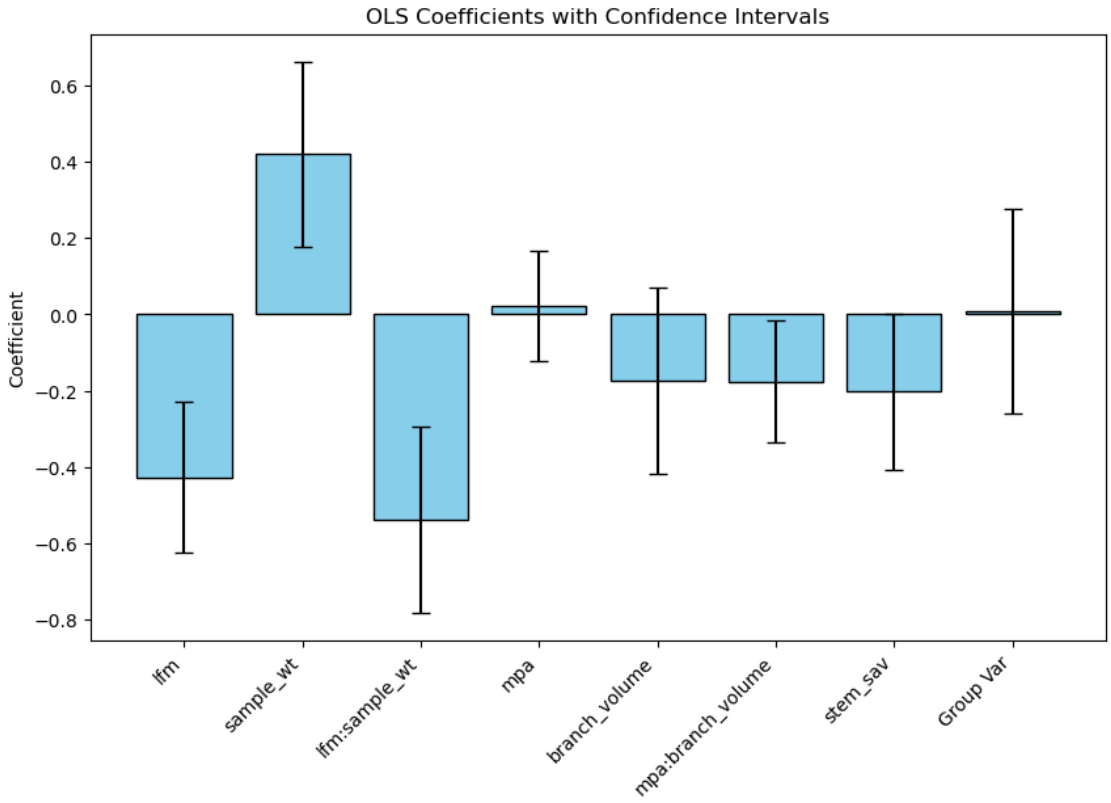
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.109	0.072	-1.519	0.129	-0.249	0.032
lfm	-0.335	0.110	-3.061	0.002	-0.550	-0.121
sample_wt	0.460	0.123	3.732	0.000	0.218	0.701
lfm:sample_wt	-0.492	0.125	-3.937	0.000	-0.736	-0.247
mpa	0.035	0.076	0.463	0.643	-0.113	0.183
branch_volume	-0.172	0.123	-1.406	0.160	-0.413	0.068
mpa:branch_volume	-0.156	0.081	-1.913	0.056	-0.316	0.004
leaf_mass_ratio	0.192	0.128	1.505	0.132	-0.058	0.442
dmc	0.234	0.123	1.905	0.057	-0.007	0.474
stem_sav	-0.213	0.126	-1.682	0.093	-0.460	0.035
Group Var	0.008	0.107				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.6088
Min. group size:	1	Log-Likelihood:	-190.2956
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

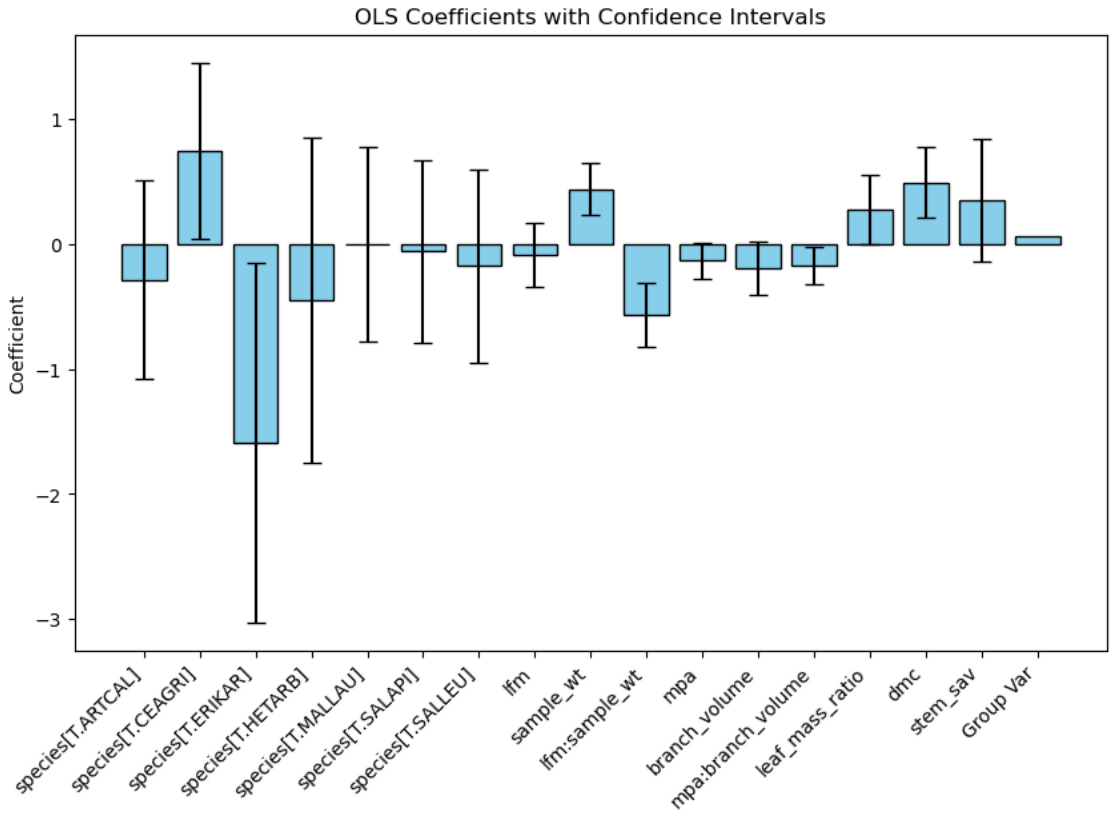
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.120	0.073	-1.644	0.100	-0.263	0.023
lfm	-0.428	0.101	-4.235	0.000	-0.625	-0.230
sample_wt	0.419	0.124	3.377	0.001	0.176	0.663
lfm:sample_wt	-0.538	0.124	-4.337	0.000	-0.781	-0.295
mpa	0.022	0.073	0.296	0.768	-0.122	0.165
branch_volume	-0.172	0.125	-1.384	0.166	-0.417	0.072
mpa:branch_volume	-0.176	0.081	-2.167	0.030	-0.335	-0.017
stem_sav	-0.202	0.105	-1.934	0.053	-0.408	0.003
Group Var	0.005	0.107				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.5176
Min. group size:	1	Log-Likelihood:	-181.2989
Max. group size:	11	Converged:	No
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.154	0.326	0.473	0.636	-0.485	0.793
species[T.ARTCAL]	-0.287	0.405	-0.709	0.479	-1.081	0.507
species[T.CEAGRI]	0.750	0.359	2.088	0.037	0.046	1.454
species[T.ERIKAR]	-1.587	0.734	-2.161	0.031	-3.026	-0.148
species[T.HETARB]	-0.451	0.663	-0.681	0.496	-1.751	0.848
species[T.MALLAU]	-0.003	0.397	-0.009	0.993	-0.782	0.775
species[T.SALAPI]	-0.055	0.373	-0.148	0.882	-0.787	0.676
species[T.SALLEU]	-0.175	0.396	-0.443	0.658	-0.952	0.601
lfm	-0.090	0.131	-0.688	0.492	-0.346	0.166
sample_wt	0.438	0.107	4.101	0.000	0.229	0.647
lfm:sample_wt	-0.564	0.129	-4.364	0.000	-0.817	-0.311
mpa	-0.133	0.072	-1.854	0.064	-0.274	0.008
branch_volume	-0.193	0.108	-1.779	0.075	-0.405	0.020
mpa:branch_volume	-0.176	0.076	-2.315	0.021	-0.326	-0.027
leaf_mass_ratio	0.275	0.140	1.963	0.050	0.000	0.550
dmc	0.495	0.143	3.461	0.001	0.215	0.775
stem_sav	0.347	0.251	1.384	0.166	-0.144	0.838
Group Var	0.035					

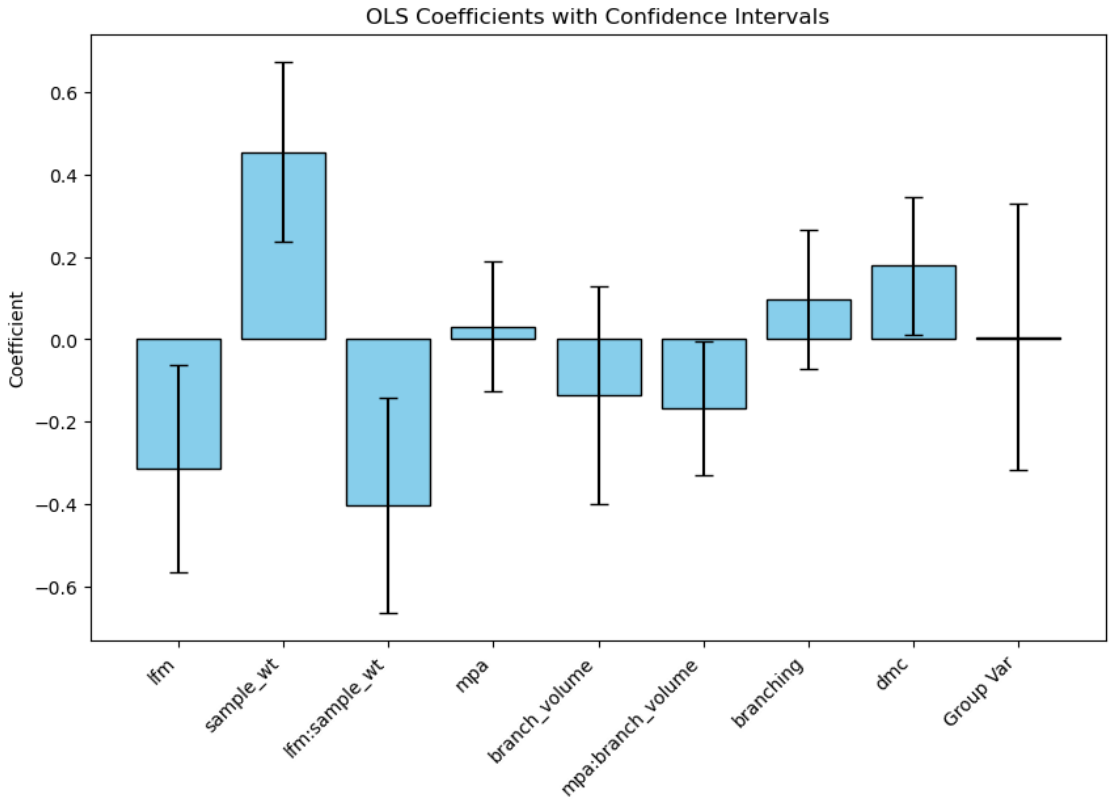


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.6026
Min. group size:	1	Log-Likelihood:	-189.3087
Max. group size:	11	Converged:	No
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.090	0.072	-1.250	0.211	-0.230	0.051
lfm	-0.315	0.128	-2.460	0.014	-0.566	-0.064
sample_wt	0.455	0.112	4.061	0.000	0.235	0.675
lfm:sample_wt	-0.402	0.133	-3.018	0.003	-0.663	-0.141
mpa	0.031	0.080	0.390	0.697	-0.126	0.189
branch_volume	-0.134	0.135	-0.997	0.319	-0.399	0.130
mpa:branch_volume	-0.167	0.083	-2.008	0.045	-0.330	-0.004
branching	0.096	0.086	1.121	0.262	-0.072	0.264
dmc	0.178	0.085	2.089	0.037	0.011	0.345
Group Var	0.003	0.128				

==========

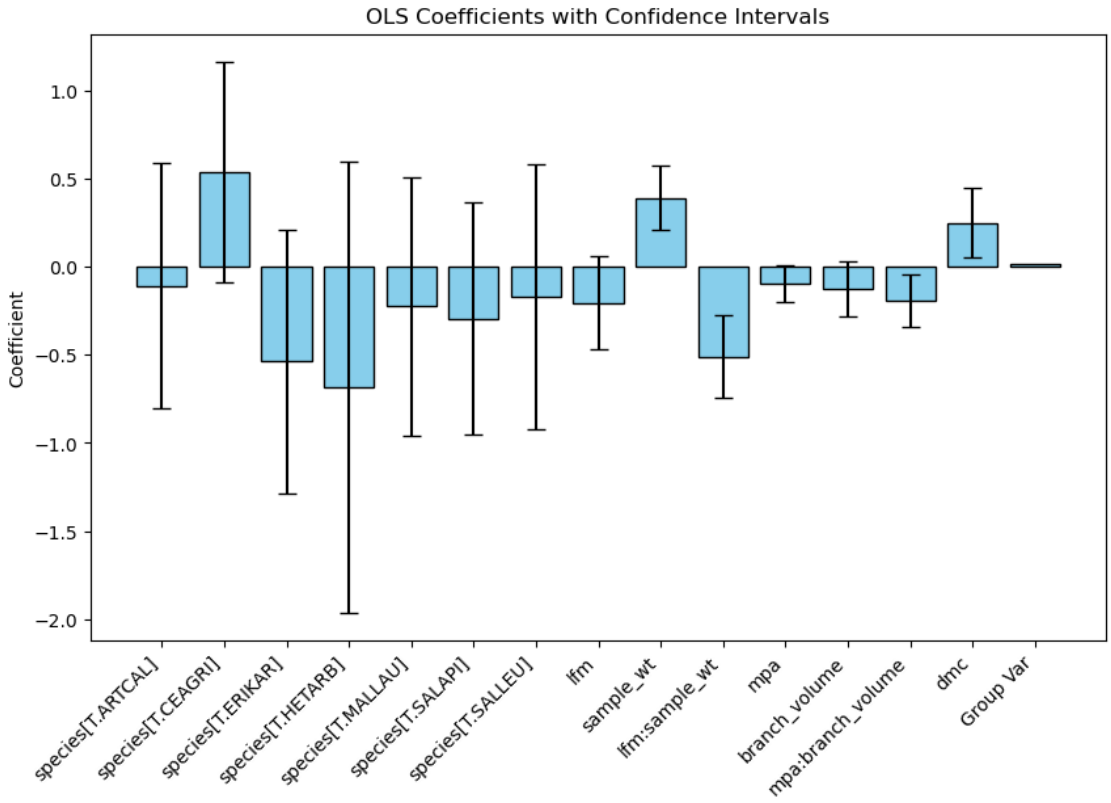


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.5548
Min. group size:	1	Log-Likelihood:	-183.3376
Max. group size:	11	Converged:	No
Mean group size:	3.0		

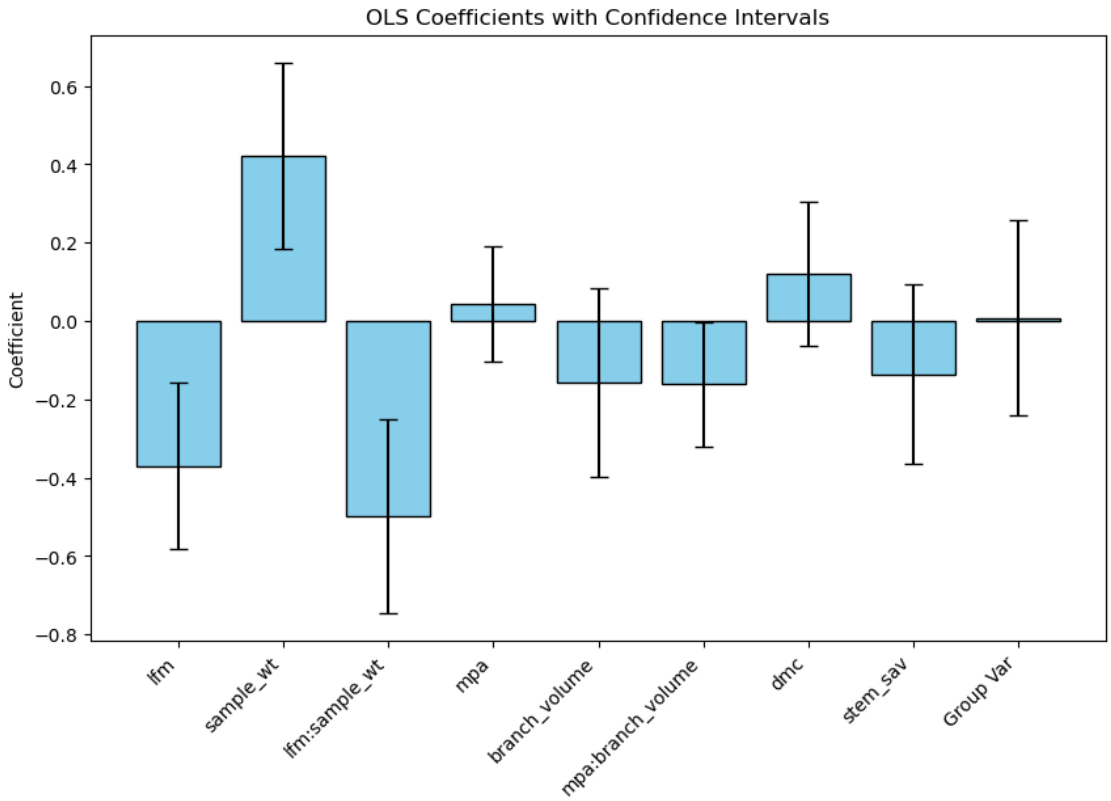
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.023	0.291	0.080	0.936	-0.547	0.593
species[T.ARTCAL]	-0.107	0.356	-0.302	0.762	-0.804	0.589
species[T.CEAGRI]	0.540	0.319	1.693	0.090	-0.085	1.165
species[T.ERIKAR]	-0.539	0.381	-1.414	0.157	-1.286	0.208
species[T.HETARB]	-0.682	0.653	-1.046	0.296	-1.962	0.597
species[T.MALLAU]	-0.225	0.374	-0.601	0.548	-0.958	0.508
species[T.SALAPI]	-0.294	0.337	-0.871	0.384	-0.954	0.367
species[T.SALLEU]	-0.173	0.384	-0.449	0.653	-0.925	0.580

```
lfm                -0.205    0.134 -1.532 0.125 -0.467  0.057
sample_wt           0.391    0.092  4.263 0.000  0.211  0.570
lfm:sample_wt      -0.510    0.118 -4.310 0.000 -0.742 -0.278
mpa                -0.099    0.053 -1.842 0.066 -0.203  0.006
branch_volume      -0.125    0.080 -1.564 0.118 -0.282  0.032
mpa:branch_volume  -0.195    0.076 -2.557 0.011 -0.344 -0.045
dmc                 0.249    0.101  2.457 0.014  0.050  0.448
Group Var           0.008
============================================================
```



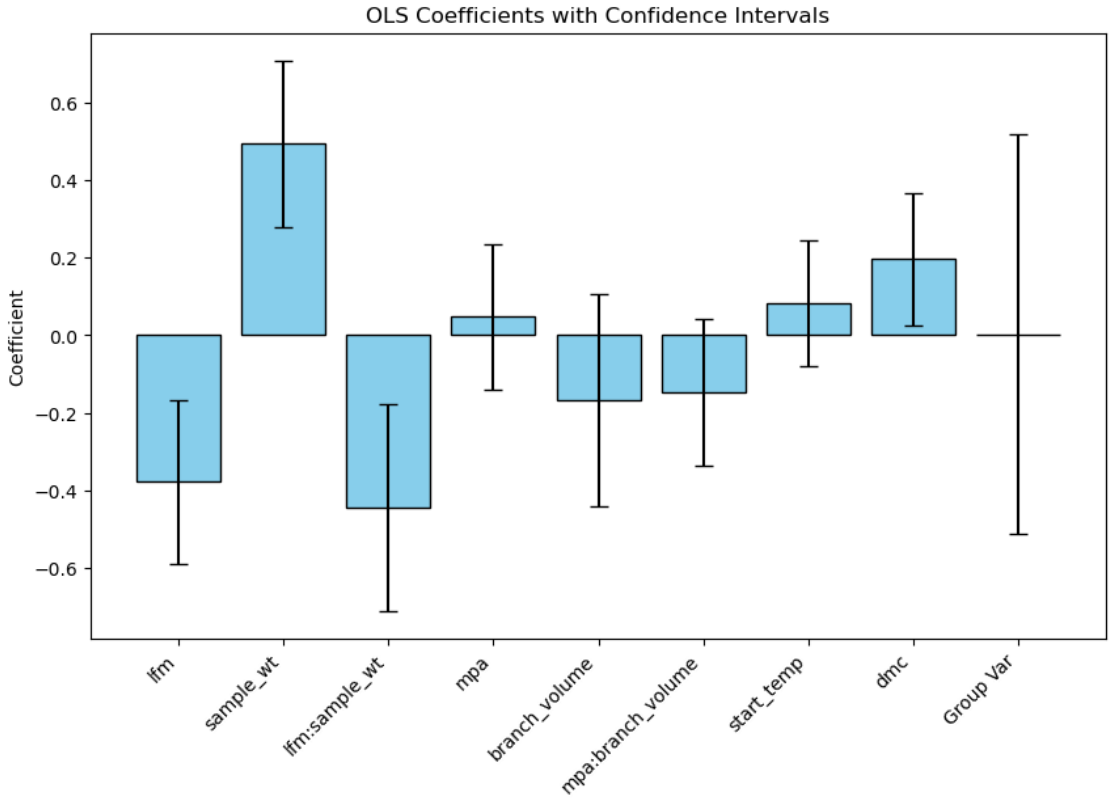

```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.6022
Min. group size:     1        Log-Likelihood:      -189.3573
Max. group size:     11       Converged:           No
Mean group size:     3.0
------------------------------------------------------------
                 Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
```

```
Intercept          -0.111    0.071 -1.562 0.118 -0.251  0.028
lfm                -0.371    0.108 -3.432 0.001 -0.582 -0.159
sample_wt           0.421    0.122  3.457 0.001  0.182  0.660
lfm:sample_wt      -0.497    0.126 -3.943 0.000 -0.745 -0.250
mpa                 0.043    0.075  0.575 0.565 -0.104  0.191
branch_volume      -0.157    0.123 -1.275 0.202 -0.399  0.084
mpa:branch_volume  -0.162    0.081 -1.994 0.046 -0.322 -0.003
dmc                 0.120    0.093  1.290 0.197 -0.063  0.304
stem_sav           -0.136    0.116 -1.167 0.243 -0.364  0.092
Group Var           0.004    0.099
============================================================
```




```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.6049
Min. group size:     1        Log-Likelihood:      -189.3591
Max. group size:     11       Converged:           Yes
Mean group size:     3.0
------------------------------------------------------------
```

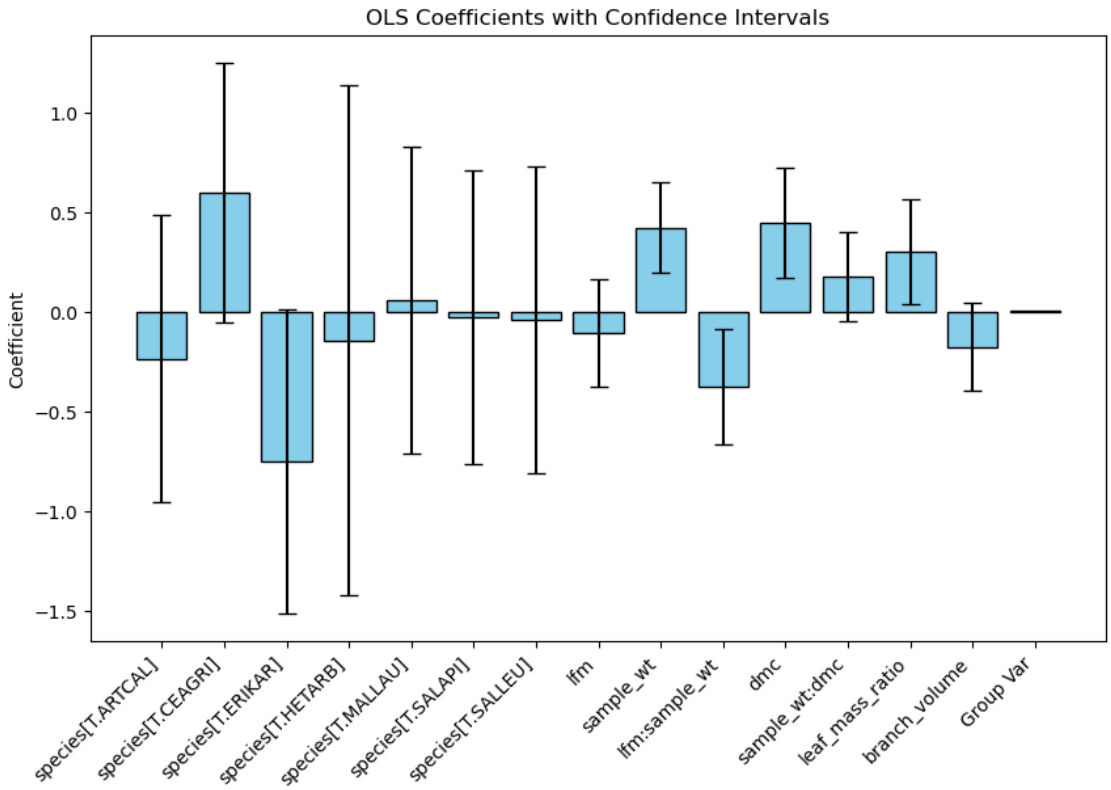
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.099	0.084	-1.180	0.238	-0.263	0.065
lfm	-0.378	0.108	-3.509	0.000	-0.589	-0.167
sample_wt	0.494	0.109	4.514	0.000	0.280	0.709
lfm:sample_wt	-0.444	0.136	-3.272	0.001	-0.710	-0.178
mpa	0.047	0.095	0.496	0.620	-0.139	0.234
branch_volume	-0.168	0.139	-1.201	0.230	-0.441	0.106
mpa:branch_volume	-0.147	0.096	-1.530	0.126	-0.336	0.041
start_temp	0.081	0.083	0.981	0.327	-0.081	0.244
dmc	0.196	0.087	2.245	0.025	0.025	0.367
Group Var	0.002	0.205				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.5598
Min. group size:	1	Log-Likelihood:	-183.4171
Max. group size:	11	Converged:	No

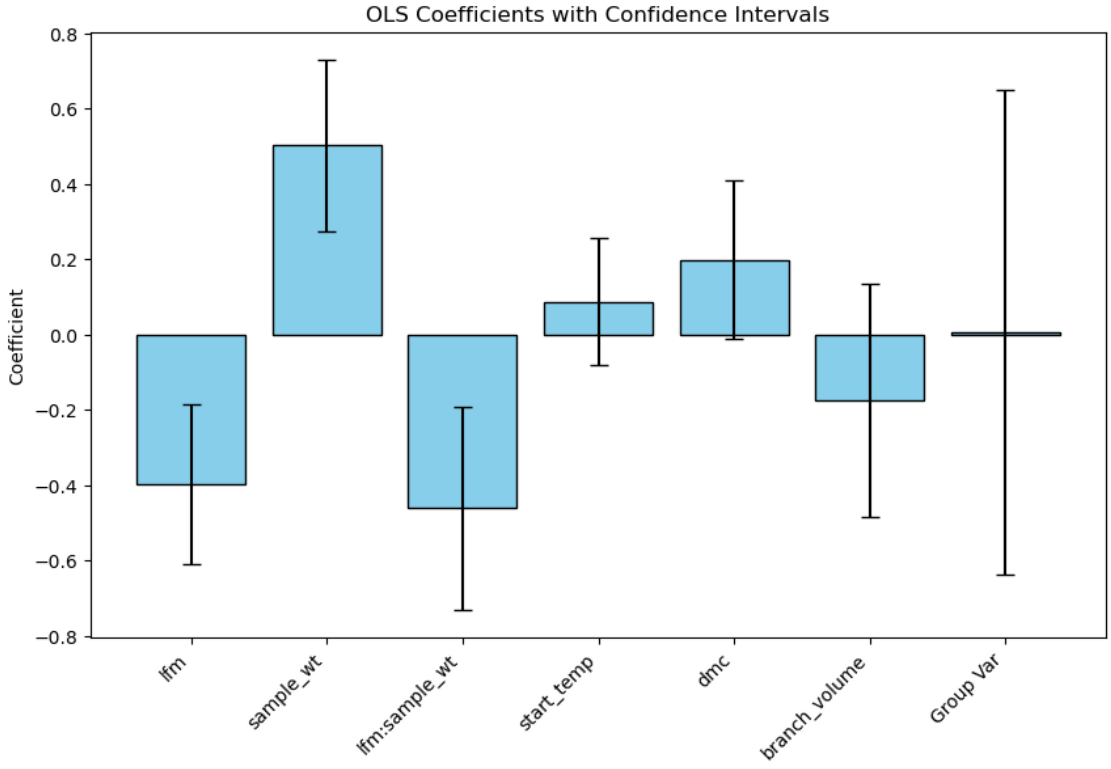
```
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept         -0.053    0.289 -0.183 0.855 -0.620  0.514
species[T.ARTCAL] -0.234    0.367 -0.638 0.523 -0.953  0.485
species[T.CEAGRI]  0.598    0.332  1.799 0.072 -0.053  1.250
species[T.ERIKAR] -0.747    0.389 -1.920 0.055 -1.509  0.016
species[T.HETARB] -0.144    0.652 -0.221 0.825 -1.422  1.134
species[T.MALLAU]  0.057    0.392  0.146 0.884 -0.712  0.826
species[T.SALAPI] -0.027    0.374 -0.072 0.943 -0.760  0.706
species[T.SALLEU] -0.038    0.392 -0.097 0.922 -0.806  0.730
lfm               -0.105    0.138 -0.759 0.448 -0.376  0.166
sample_wt          0.423    0.116  3.640 0.000  0.195  0.650
lfm:sample_wt     -0.375    0.149 -2.525 0.012 -0.666 -0.084
dmc                0.447    0.141  3.167 0.002  0.170  0.724
sample_wt:dmc      0.178    0.114  1.567 0.117 -0.045  0.402
leaf_mass_ratio    0.301    0.134  2.251 0.024  0.039  0.564
branch_volume     -0.175    0.112 -1.563 0.118 -0.395  0.044
Group Var          0.004
============================================================
```



Mixed Linear Model Regression Results

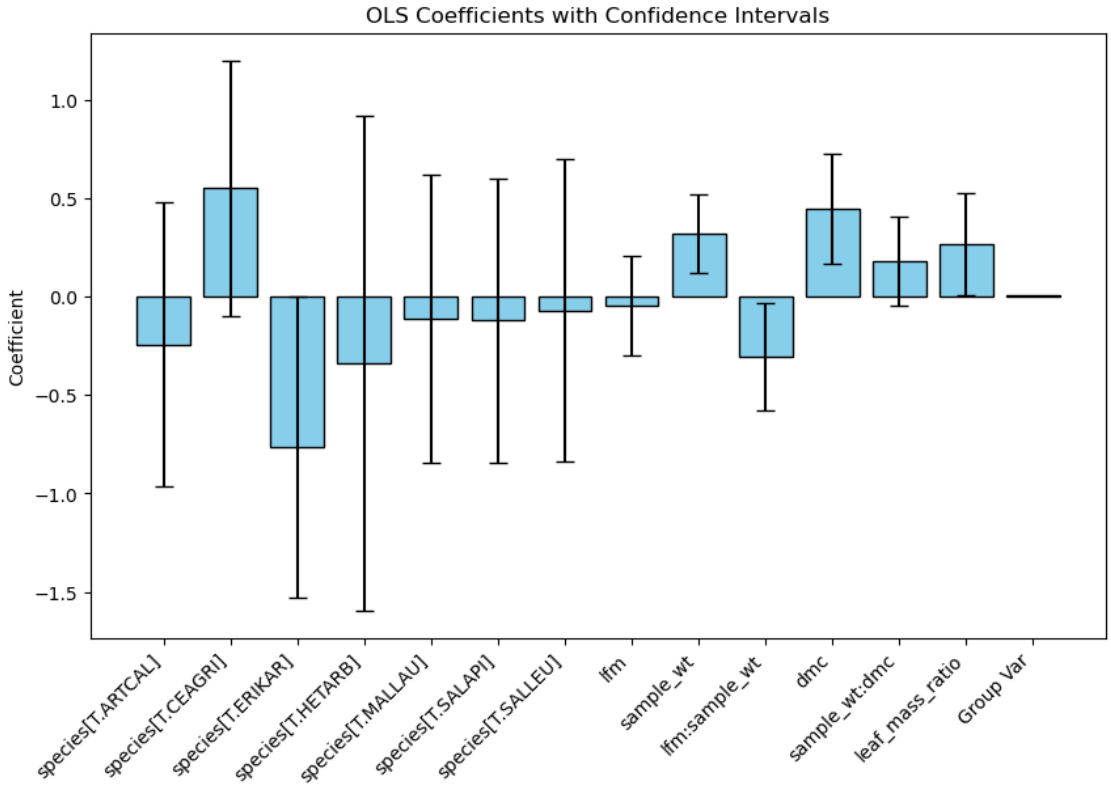
Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.6186
Min. group size:	1	Log-Likelihood:	-191.4590
Max. group size:	11	Converged:	No
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.095	0.085	-1.124	0.261	-0.261	0.071
lfm	-0.397	0.108	-3.660	0.000	-0.610	-0.184
sample_wt	0.502	0.116	4.324	0.000	0.274	0.730
lfm:sample_wt	-0.460	0.138	-3.343	0.001	-0.730	-0.190
start_temp	0.086	0.086	1.004	0.316	-0.082	0.255
dmc	0.198	0.108	1.840	0.066	-0.013	0.410
branch_volume	-0.175	0.158	-1.107	0.268	-0.484	0.135
Group Var	0.004	0.258				



Mixed Linear Model Regression Results

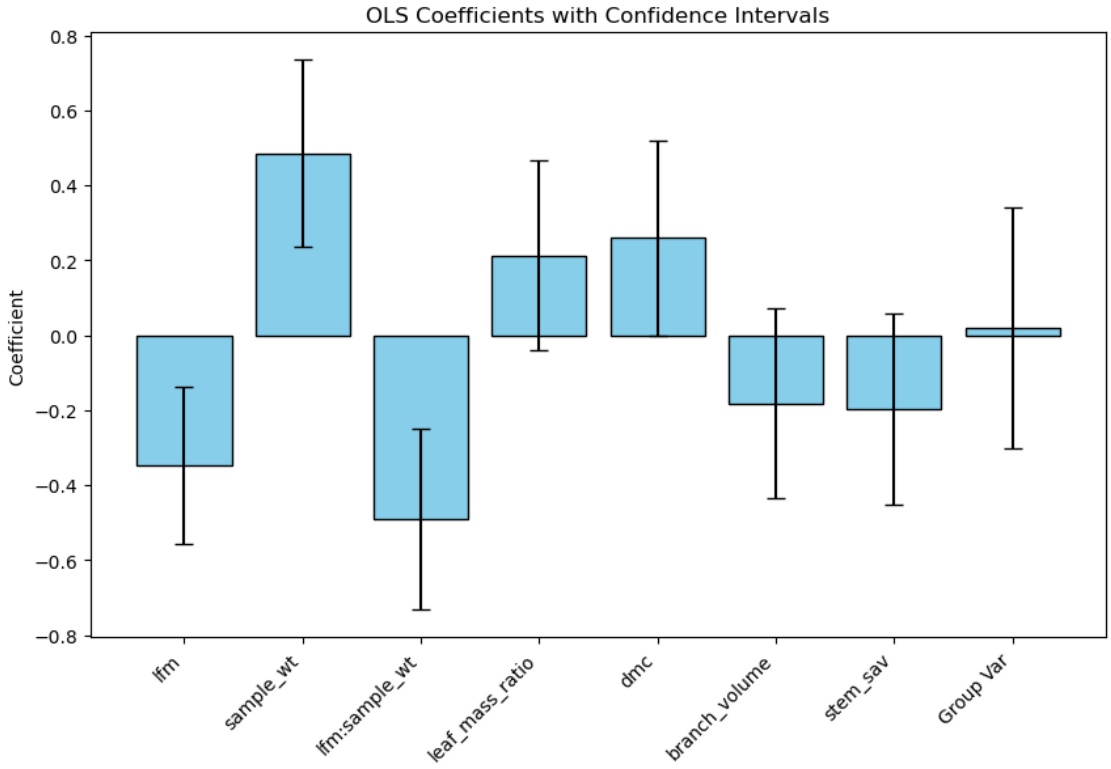
```
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5685
Min. group size:     1        Log-Likelihood:      -184.4786
Max. group size:     11       Converged:           No
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept          0.020    0.286  0.069 0.945 -0.541  0.581
species[T.ARTCAL] -0.243    0.369 -0.660 0.509 -0.966  0.479
species[T.CEAGRI]  0.550    0.332  1.655 0.098 -0.101  1.201
species[T.ERIKAR] -0.764    0.390 -1.956 0.050 -1.529  0.002
species[T.HETARB] -0.336    0.642 -0.524 0.601 -1.594  0.922
species[T.MALLAU] -0.113    0.374 -0.301 0.763 -0.846  0.620
species[T.SALAPI] -0.122    0.368 -0.332 0.740 -0.843  0.599
species[T.SALLEU] -0.071    0.393 -0.180 0.857 -0.840  0.699
lfm               -0.045    0.129 -0.351 0.726 -0.299  0.208
sample_wt          0.320    0.100  3.190 0.001  0.124  0.517
lfm:sample_wt     -0.306    0.140 -2.188 0.029 -0.580 -0.032
dmc                0.445    0.142  3.126 0.002  0.166  0.724
sample_wt:dmc      0.181    0.114  1.583 0.113 -0.043  0.405
leaf_mass_ratio    0.268    0.132  2.021 0.043  0.008  0.527
Group Var          0.003
============================================================
```



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.6032
Min. group size:	1	Log-Likelihood:	-190.4814
Max. group size:	11	Converged:	No
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.100	0.072	-1.397	0.162	-0.240	0.040
lfm	-0.346	0.107	-3.241	0.001	-0.555	-0.137
sample_wt	0.484	0.127	3.802	0.000	0.235	0.734
lfm:sample_wt	-0.492	0.123	-3.997	0.000	-0.733	-0.251
leaf_mass_ratio	0.213	0.129	1.648	0.099	-0.040	0.467
dmc	0.259	0.132	1.958	0.050	-0.000	0.519
branch_volume	-0.182	0.129	-1.413	0.158	-0.433	0.070
stem_sav	-0.197	0.130	-1.521	0.128	-0.451	0.057
Group Var	0.012	0.128				

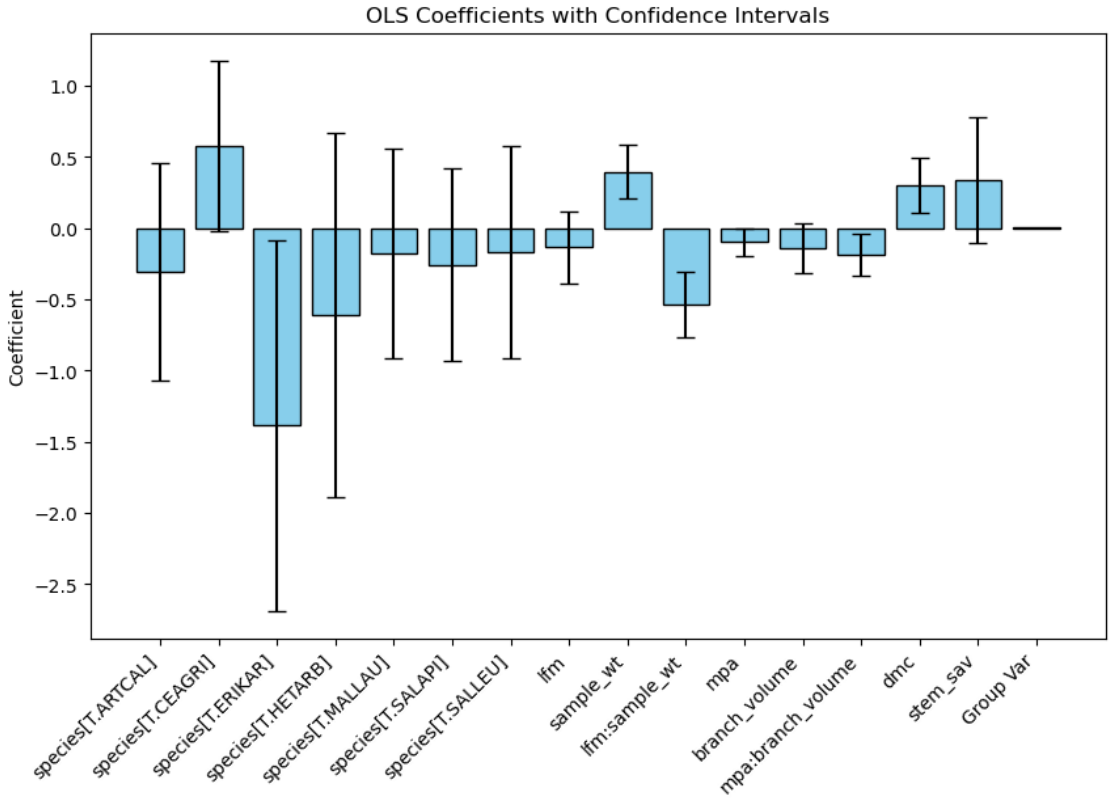


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.5512
Min. group size:	1	Log-Likelihood:	-182.5004
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

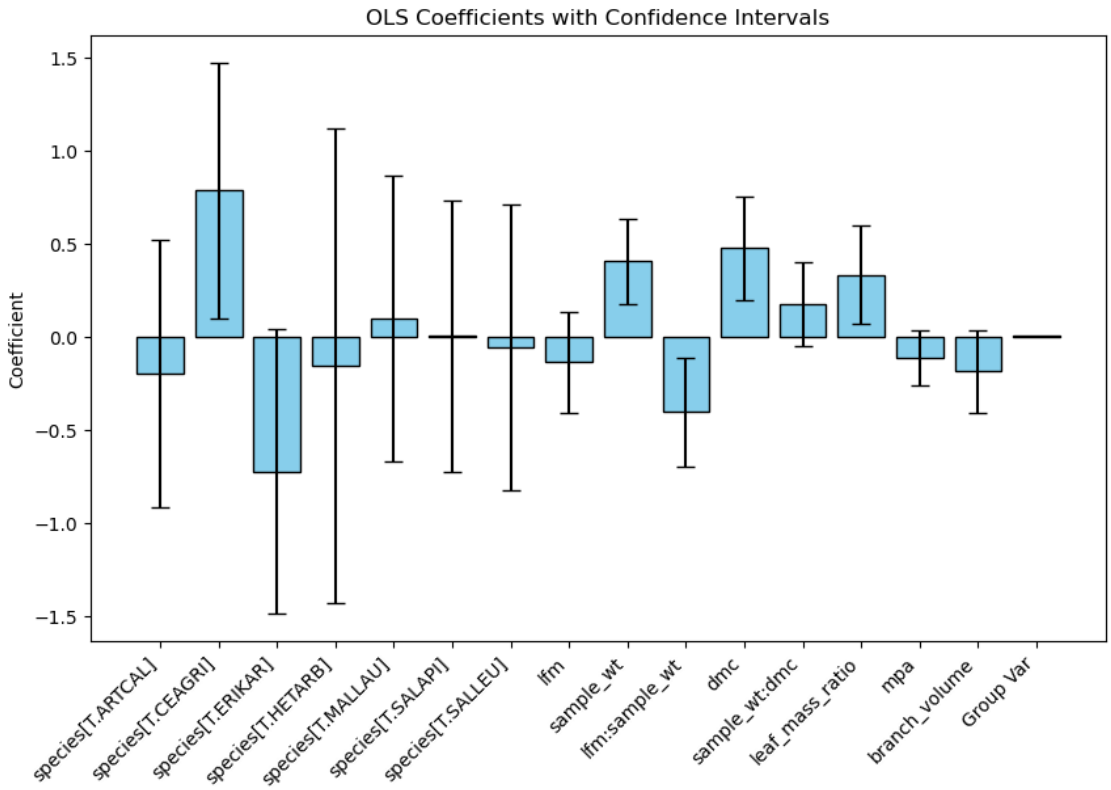
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.200	0.312	0.643	0.520	-0.410	0.811
species[T.ARTCAL]	-0.304	0.390	-0.778	0.436	-1.068	0.461
species[T.CEAGRI]	0.578	0.307	1.883	0.060	-0.023	1.180
species[T.ERIKAR]	-1.384	0.664	-2.083	0.037	-2.686	-0.081
species[T.HETARB]	-0.612	0.653	-0.937	0.349	-1.893	0.668
species[T.MALLAU]	-0.180	0.376	-0.480	0.631	-0.917	0.556
species[T.SALAPI]	-0.257	0.344	-0.745	0.456	-0.931	0.418
species[T.SALLEU]	-0.172	0.381	-0.451	0.652	-0.918	0.575
lfm	-0.135	0.131	-1.032	0.302	-0.392	0.122
sample_wt	0.398	0.095	4.197	0.000	0.212	0.584
lfm:sample_wt	-0.534	0.117	-4.584	0.000	-0.762	-0.306
mpa	-0.098	0.050	-1.951	0.051	-0.197	0.000

```
branch_volume      -0.139    0.089 -1.574 0.115 -0.313  0.034
mpa:branch_volume  -0.189    0.076 -2.482 0.013 -0.338 -0.040
dmc                 0.303    0.099  3.053 0.002  0.108  0.497
stem_sav            0.337    0.225  1.498 0.134 -0.104  0.777
Group Var           0.006
============================================================
```



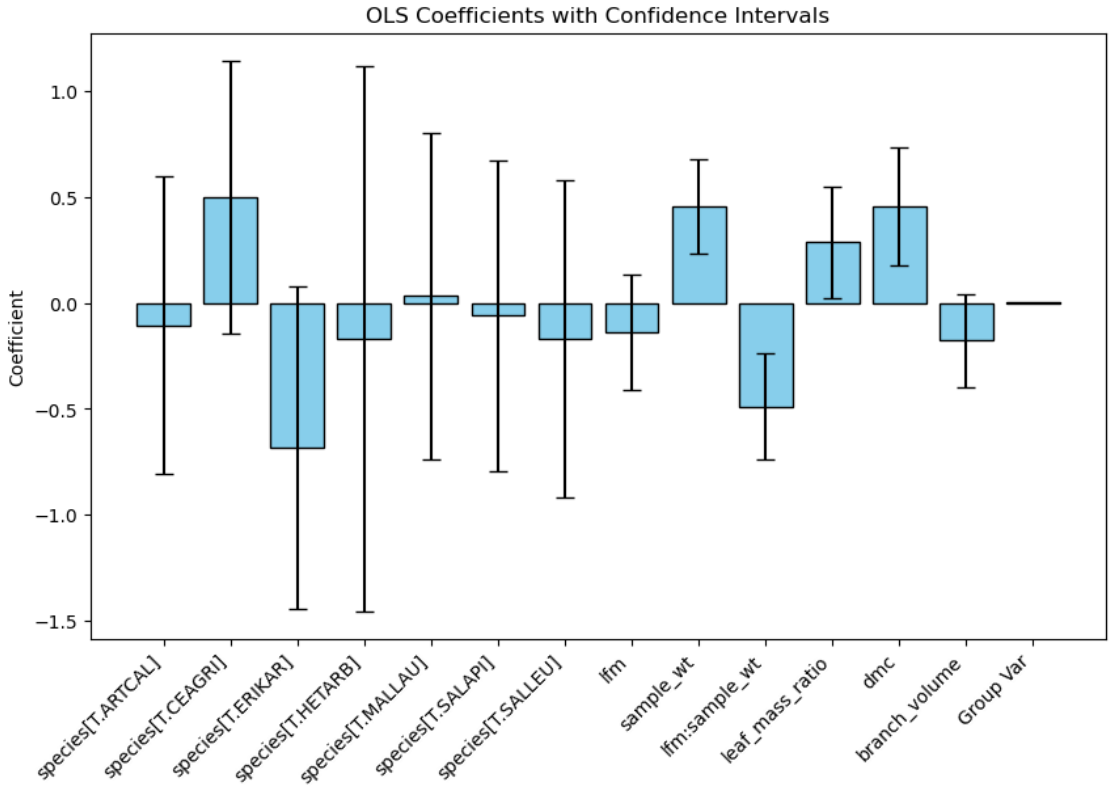

```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5525
Min. group size:     1        Log-Likelihood:      -182.5015
Max. group size:     11       Converged:           Yes
Mean group size:     3.0
------------------------------------------------------------
                   Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept          -0.107    0.291 -0.370 0.712 -0.677  0.462
species[T.ARTCAL]  -0.197    0.365 -0.540 0.589 -0.913  0.519
species[T.CEAGRI]   0.787    0.350  2.251 0.024  0.102  1.472
```

```
species[T.ERIKAR] -0.721    0.388 -1.859 0.063 -1.482  0.039
species[T.HETARB] -0.155    0.648 -0.239 0.811 -1.425  1.115
species[T.MALLAU]  0.100    0.391  0.255 0.798 -0.667  0.867
species[T.SALAPI]  0.006    0.372  0.016 0.988 -0.723  0.734
species[T.SALLEU] -0.059    0.390 -0.150 0.881 -0.824  0.707
lfm               -0.135    0.138 -0.977 0.328 -0.406  0.136
sample_wt          0.405    0.117  3.448 0.001  0.175  0.635
lfm:sample_wt     -0.404    0.149 -2.704 0.007 -0.697 -0.111
dmc                0.475    0.141  3.376 0.001  0.199  0.750
sample_wt:dmc      0.176    0.113  1.552 0.121 -0.046  0.398
leaf_mass_ratio    0.331    0.135  2.452 0.014  0.067  0.596
mpa               -0.112    0.076 -1.466 0.143 -0.261  0.038
branch_volume     -0.185    0.112 -1.648 0.099 -0.405  0.035
Group Var          0.005
============================================================
```




```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5690
```

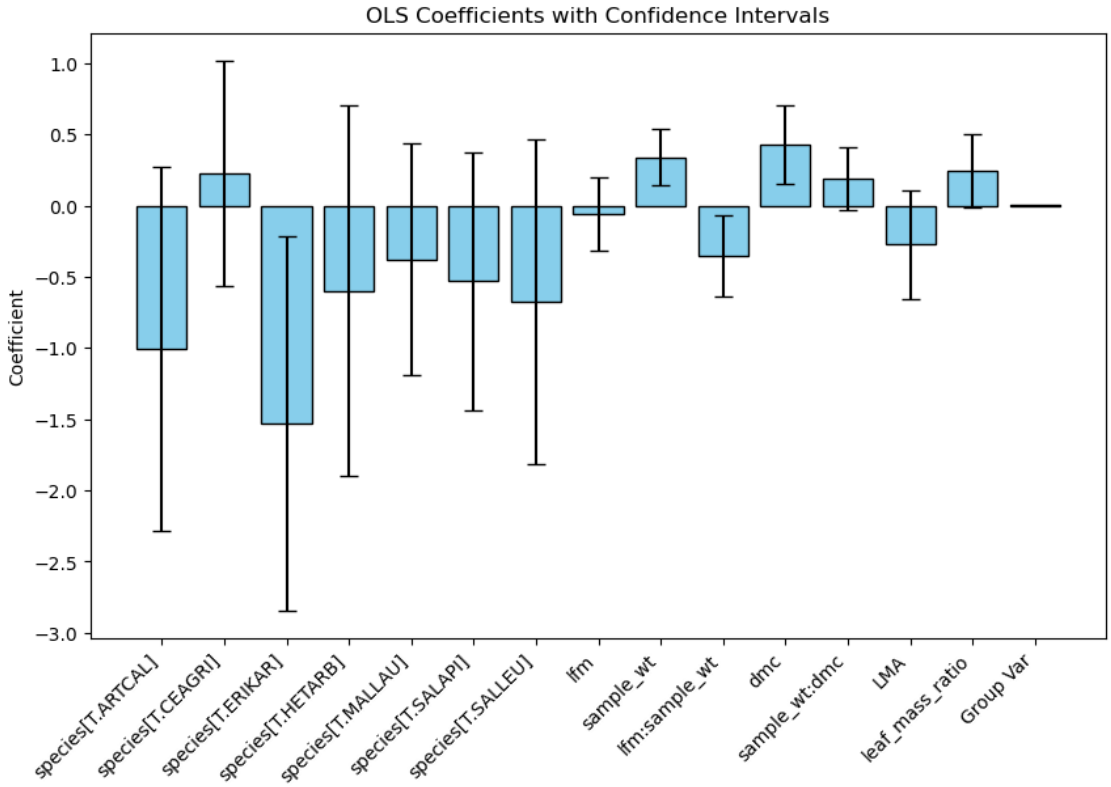
```
Min. group size:     1        Log-Likelihood:      -184.5169
Max. group size:     11       Converged:           Yes
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept          0.005    0.288  0.018 0.985 -0.559  0.569
species[T.ARTCAL] -0.107    0.358 -0.298 0.766 -0.809  0.596
species[T.CEAGRI]  0.499    0.329  1.519 0.129 -0.145  1.143
species[T.ERIKAR] -0.682    0.388 -1.757 0.079 -1.442  0.079
species[T.HETARB] -0.169    0.656 -0.258 0.797 -1.454  1.116
species[T.MALLAU]  0.032    0.393  0.082 0.935 -0.738  0.802
species[T.SALAPI] -0.060    0.375 -0.161 0.872 -0.795  0.674
species[T.SALLEU] -0.169    0.383 -0.442 0.658 -0.920  0.581
lfm               -0.141    0.139 -1.019 0.308 -0.414  0.131
sample_wt          0.454    0.115  3.956 0.000  0.229  0.679
lfm:sample_wt     -0.489    0.127 -3.845 0.000 -0.738 -0.240
leaf_mass_ratio    0.285    0.134  2.130 0.033  0.023  0.548
dmc                0.456    0.142  3.214 0.001  0.178  0.734
branch_volume     -0.177    0.112 -1.582 0.114 -0.397  0.042
Group Var          0.002
============================================================
```



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.5611
Min. group size:	1	Log-Likelihood:	-183.5311
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.490	0.438	1.119	0.263	-0.368	1.347
species[T.ARTCAL]	-1.004	0.653	-1.538	0.124	-2.284	0.276
species[T.CEAGRI]	0.227	0.405	0.560	0.576	-0.566	1.019
species[T.ERIKAR]	-1.531	0.669	-2.289	0.022	-2.843	-0.220
species[T.HETARB]	-0.598	0.664	-0.901	0.368	-1.898	0.703
species[T.MALLAU]	-0.380	0.414	-0.916	0.359	-1.192	0.433
species[T.SALAPI]	-0.532	0.463	-1.148	0.251	-1.439	0.376
species[T.SALLEU]	-0.680	0.582	-1.168	0.243	-1.820	0.461
lfm	-0.060	0.132	-0.456	0.648	-0.319	0.199
sample_wt	0.339	0.101	3.351	0.001	0.141	0.537
lfm:sample_wt	-0.354	0.144	-2.461	0.014	-0.636	-0.072
dmc	0.428	0.142	3.002	0.003	0.148	0.707
sample_wt:dmc	0.189	0.114	1.661	0.097	-0.034	0.413
LMA	-0.274	0.194	-1.415	0.157	-0.653	0.105
leaf_mass_ratio	0.244	0.133	1.843	0.065	-0.015	0.504
Group Var	0.003					

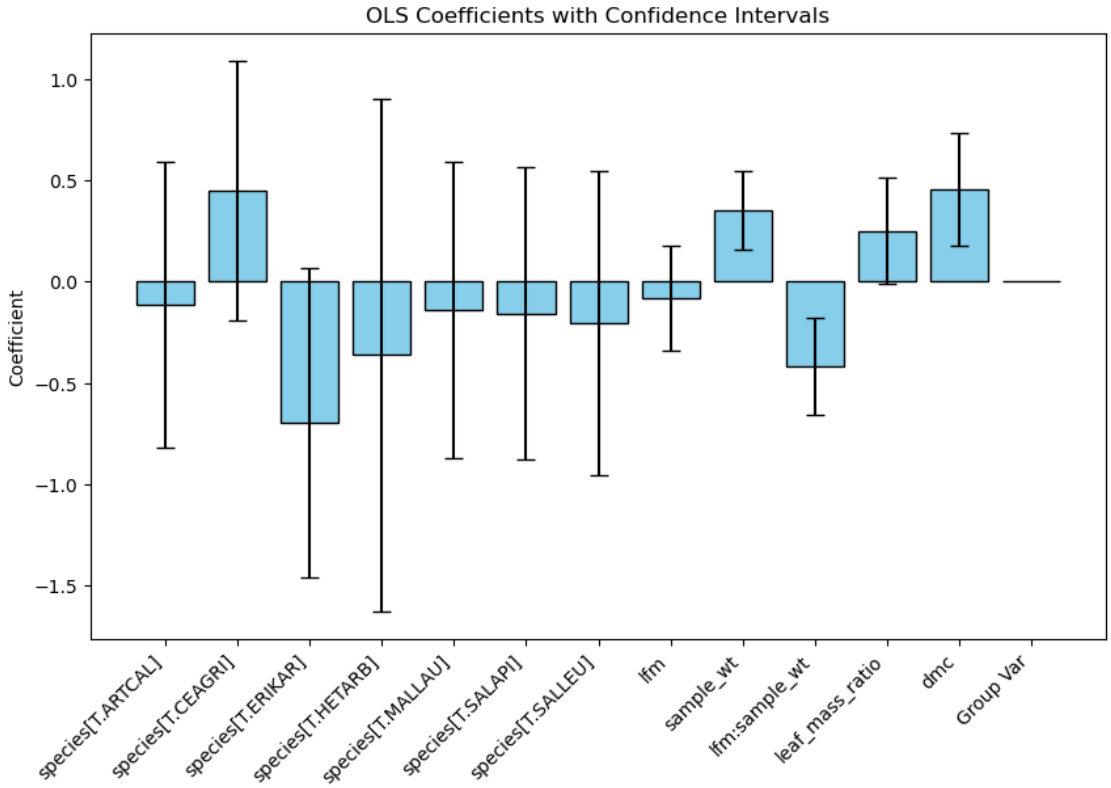


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.5781
Min. group size:	1	Log-Likelihood:	-185.5763
Max. group size:	11	Converged:	No
Mean group size:	3.0		

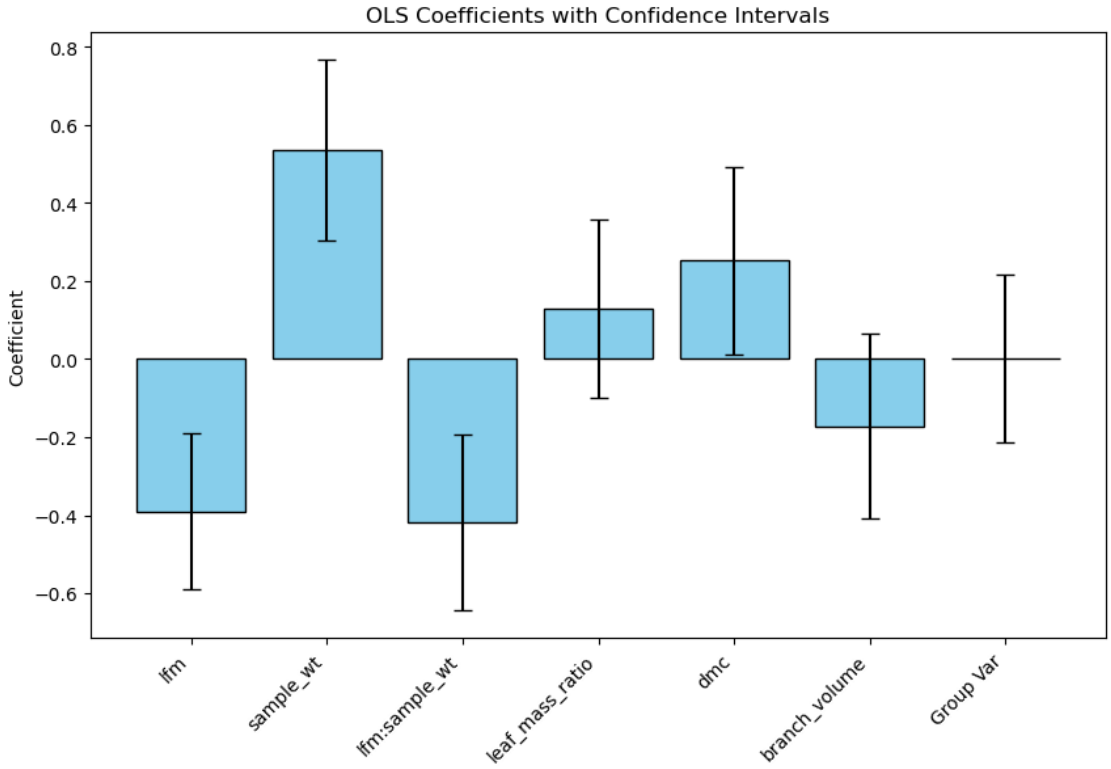
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.080	0.284	0.281	0.779	-0.477	0.636
species[T.ARTCAL]	-0.114	0.360	-0.317	0.751	-0.820	0.591
species[T.CEAGRI]	0.449	0.328	1.368	0.171	-0.194	1.091
species[T.ERIKAR]	-0.697	0.389	-1.792	0.073	-1.460	0.065
species[T.HETARB]	-0.364	0.645	-0.564	0.573	-1.627	0.900
species[T.MALLAU]	-0.140	0.373	-0.376	0.707	-0.872	0.591
species[T.SALAPI]	-0.157	0.368	-0.427	0.669	-0.878	0.564
species[T.SALLEU]	-0.204	0.383	-0.533	0.594	-0.956	0.547
lfm	-0.082	0.131	-0.625	0.532	-0.338	0.175
sample_wt	0.351	0.099	3.543	0.000	0.157	0.545
lfm:sample_wt	-0.420	0.122	-3.450	0.001	-0.659	-0.181

```
leaf_mass_ratio    0.251    0.132  1.897 0.058 -0.008  0.510
dmc                0.454    0.143  3.176 0.001  0.174  0.734
Group Var          0.001
============================================================
```



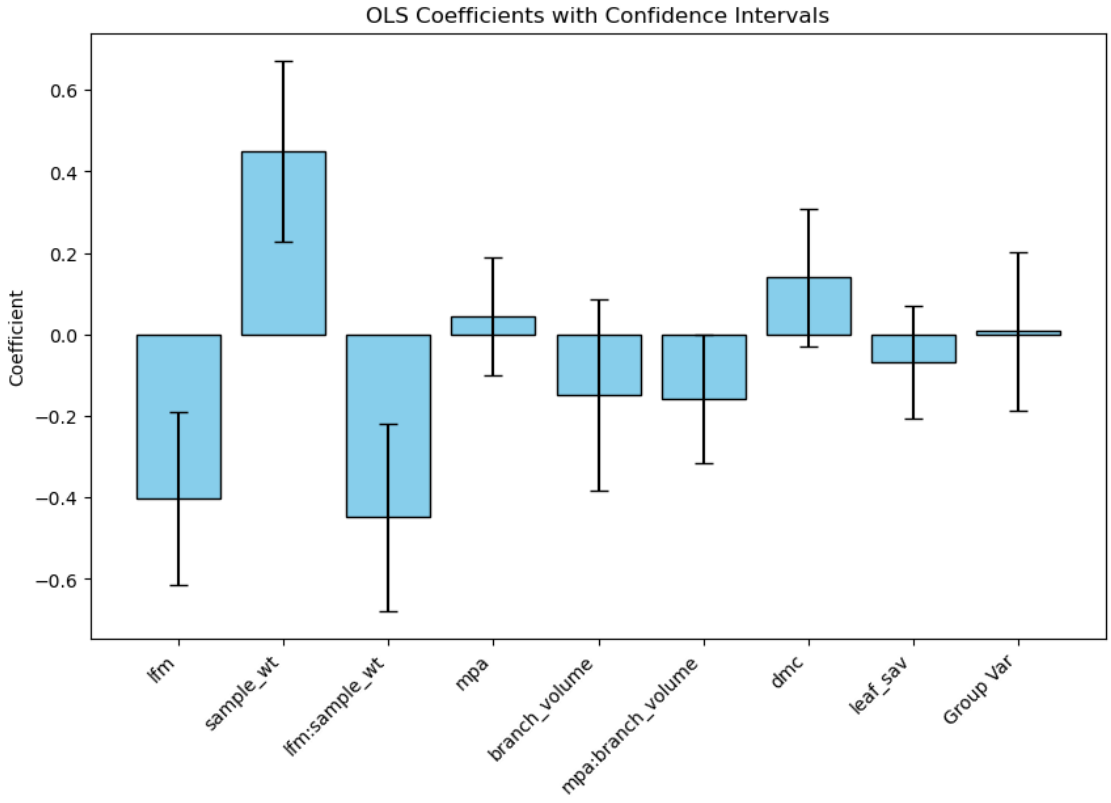

```
          Mixed Linear Model Regression Results
============================================================
Model:             MixedLM  Dependent Variable:  fd
No. Observations:  162      Method:              ML
No. Groups:        54       Scale:               0.6231
Min. group size:   1        Log-Likelihood:      -191.5794
Max. group size:   11       Converged:           Yes
Mean group size:   3.0
------------------------------------------------------------
                Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept       -0.080    0.069 -1.166 0.244 -0.215  0.055
lfm             -0.391    0.102 -3.843 0.000 -0.590 -0.191
sample_wt        0.534    0.118  4.526 0.000  0.303  0.765
lfm:sample_wt   -0.419    0.115 -3.636 0.000 -0.645 -0.193
leaf_mass_ratio  0.128    0.117  1.097 0.273 -0.101  0.357
```

```
dmc              0.253    0.122  2.065 0.039  0.013  0.493
branch_volume   -0.173    0.121 -1.431 0.152 -0.409  0.064
Group Var        0.000    0.086
============================================================
```



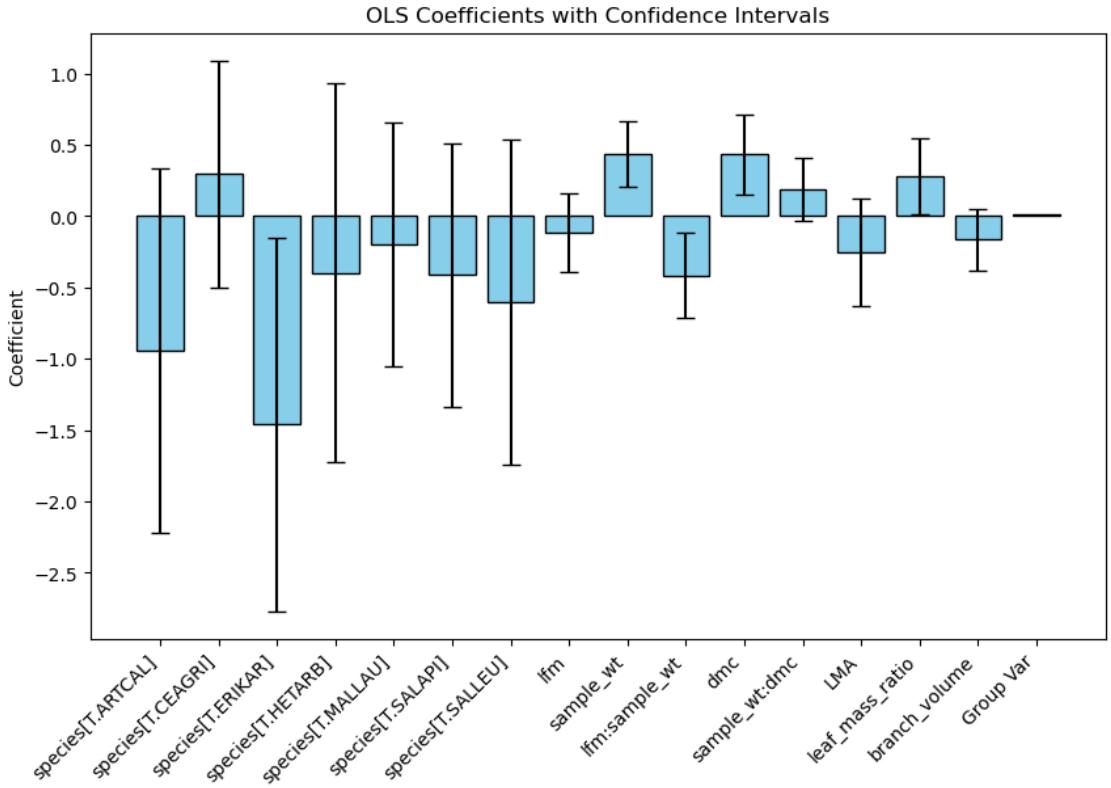

```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.6036
Min. group size:     1        Log-Likelihood:      -189.5809
Max. group size:     11       Converged:           Yes
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept        -0.097    0.069 -1.420 0.156 -0.232  0.037
lfm              -0.402    0.108 -3.713 0.000 -0.613 -0.190
sample_wt         0.450    0.113  3.971 0.000  0.228  0.672
lfm:sample_wt    -0.449    0.117 -3.845 0.000 -0.678 -0.220
mpa               0.044    0.074  0.595 0.552 -0.101  0.189
branch_volume    -0.148    0.120 -1.231 0.218 -0.382  0.087
```

```
mpa:branch_volume -0.159    0.080 -1.977 0.048 -0.317 -0.001
dmc                0.140    0.086  1.627 0.104 -0.029  0.309
leaf_sav          -0.069    0.071 -0.979 0.328 -0.208  0.069
Group Var          0.005    0.077
============================================================
```



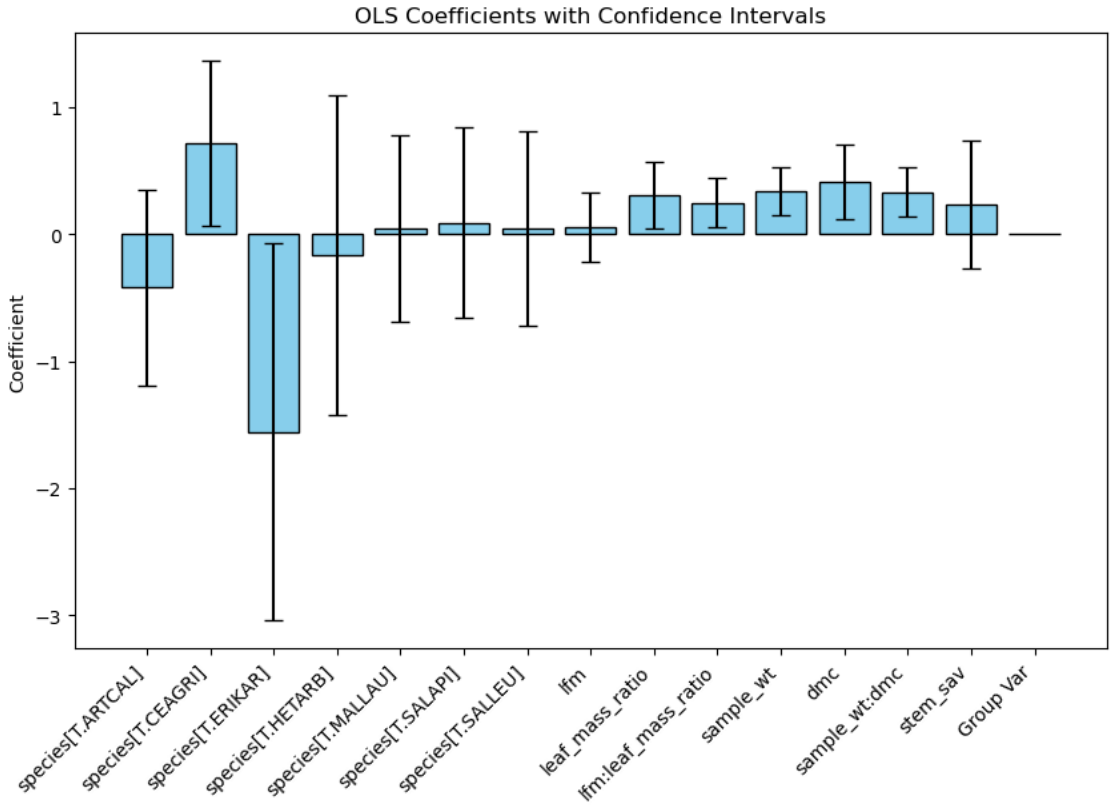

```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5534
Min. group size:     1        Log-Likelihood:      -182.5945
Max. group size:     11       Converged:           No
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept          0.388    0.443  0.876 0.381 -0.480  1.255
species[T.ARTCAL] -0.941    0.652 -1.443 0.149 -2.219  0.337
species[T.CEAGRI]  0.295    0.406  0.727 0.467 -0.501  1.091
species[T.ERIKAR] -1.460    0.668 -2.187 0.029 -2.769 -0.151
```

```
species[T.HETARB] -0.399    0.677 -0.589 0.556 -1.726  0.928
species[T.MALLAU] -0.201    0.436 -0.461 0.645 -1.056  0.653
species[T.SALAPI] -0.413    0.471 -0.875 0.381 -1.337  0.511
species[T.SALLEU] -0.605    0.582 -1.041 0.298 -1.745  0.534
lfm               -0.115    0.140 -0.824 0.410 -0.389  0.159
sample_wt          0.433    0.116  3.733 0.000  0.206  0.661
lfm:sample_wt     -0.416    0.151 -2.750 0.006 -0.713 -0.119
dmc                0.431    0.141  3.048 0.002  0.154  0.708
sample_wt:dmc      0.186    0.114  1.640 0.101 -0.036  0.409
LMA               -0.254    0.193 -1.317 0.188 -0.633  0.124
leaf_mass_ratio    0.277    0.135  2.062 0.039  0.014  0.541
branch_volume     -0.164    0.111 -1.477 0.140 -0.382  0.054
Group Var          0.005
============================================================
```




```
            Mixed Linear Model Regression Results
============================================================
Model:               MixedLM   Dependent Variable:   fd
No. Observations:    162       Method:               ML
No. Groups:          54        Scale:                0.5631
Min. group size:     1         Log-Likelihood:       -183.6043
```

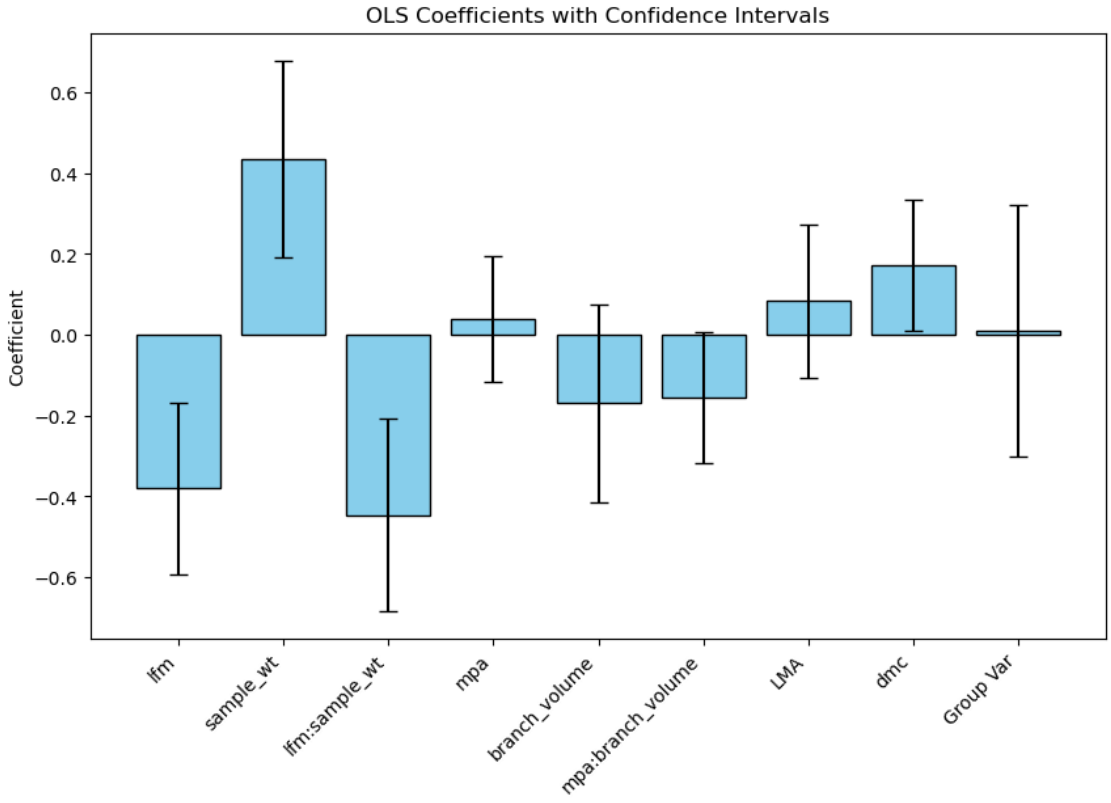
```
Max. group size:     11        Converged:            No
Mean group size:     3.0
------------------------------------------------------------
                    Coef.  Std.Err.    z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept            0.021    0.319  0.066 0.947 -0.603  0.646
species[T.ARTCAL]   -0.421    0.394 -1.067 0.286 -1.193  0.352
species[T.CEAGRI]    0.711    0.331  2.145 0.032  0.061  1.360
species[T.ERIKAR]   -1.556    0.758 -2.052 0.040 -3.043 -0.070
species[T.HETARB]   -0.169    0.641 -0.264 0.791 -1.425  1.086
species[T.MALLAU]    0.045    0.373  0.120 0.905 -0.686  0.776
species[T.SALAPI]    0.089    0.383  0.231 0.817 -0.662  0.840
species[T.SALLEU]    0.044    0.391  0.112 0.911 -0.723  0.811
lfm                  0.053    0.137  0.388 0.698 -0.215  0.321
leaf_mass_ratio      0.306    0.132  2.323 0.020  0.048  0.564
lfm:leaf_mass_ratio  0.247    0.100  2.474 0.013  0.051  0.443
sample_wt            0.339    0.098  3.465 0.001  0.147  0.530
dmc                  0.407    0.151  2.705 0.007  0.112  0.703
sample_wt:dmc        0.329    0.099  3.336 0.001  0.136  0.522
stem_sav             0.231    0.256  0.904 0.366 -0.270  0.732
Group Var            0.002
============================================================
```



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.6022
Min. group size:	1	Log-Likelihood:	-189.6231
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

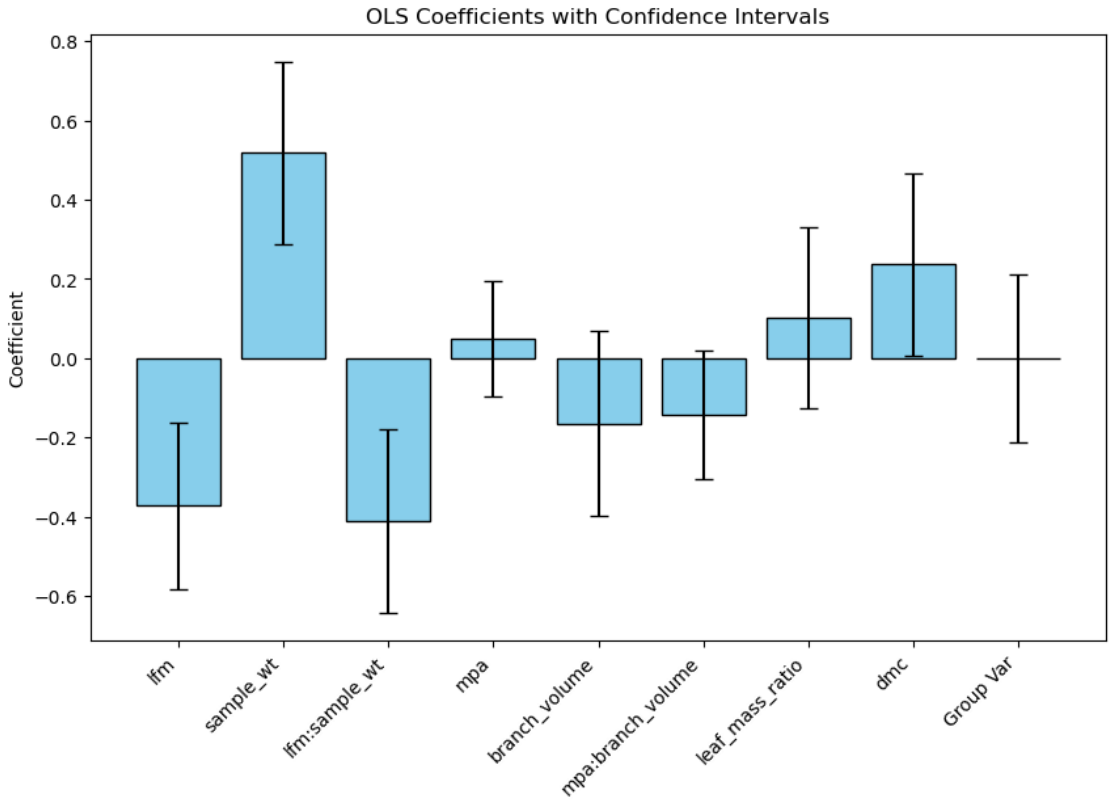
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.094	0.073	-1.287	0.198	-0.238	0.049
lfm	-0.380	0.108	-3.507	0.000	-0.592	-0.168
sample_wt	0.436	0.124	3.504	0.000	0.192	0.680
lfm:sample_wt	-0.446	0.121	-3.687	0.000	-0.683	-0.209
mpa	0.040	0.079	0.502	0.616	-0.115	0.194
branch_volume	-0.169	0.125	-1.348	0.178	-0.414	0.077
mpa:branch_volume	-0.154	0.083	-1.860	0.063	-0.317	0.008
LMA	0.084	0.097	0.863	0.388	-0.106	0.274
dmc	0.173	0.082	2.099	0.036	0.011	0.334
Group Var	0.006	0.123				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.6086
Min. group size:	1	Log-Likelihood:	-189.6466
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.086	0.069	-1.241	0.215	-0.222	0.050
lfm	-0.372	0.108	-3.460	0.001	-0.583	-0.161
sample_wt	0.519	0.117	4.424	0.000	0.289	0.749
lfm:sample_wt	-0.410	0.118	-3.464	0.001	-0.641	-0.178
mpa	0.049	0.075	0.653	0.514	-0.098	0.196
branch_volume	-0.165	0.119	-1.389	0.165	-0.398	0.068
mpa:branch_volume	-0.142	0.083	-1.717	0.086	-0.304	0.020
leaf_mass_ratio	0.102	0.116	0.882	0.378	-0.125	0.329
dmc	0.236	0.118	2.001	0.045	0.005	0.468
Group Var	0.000	0.084				

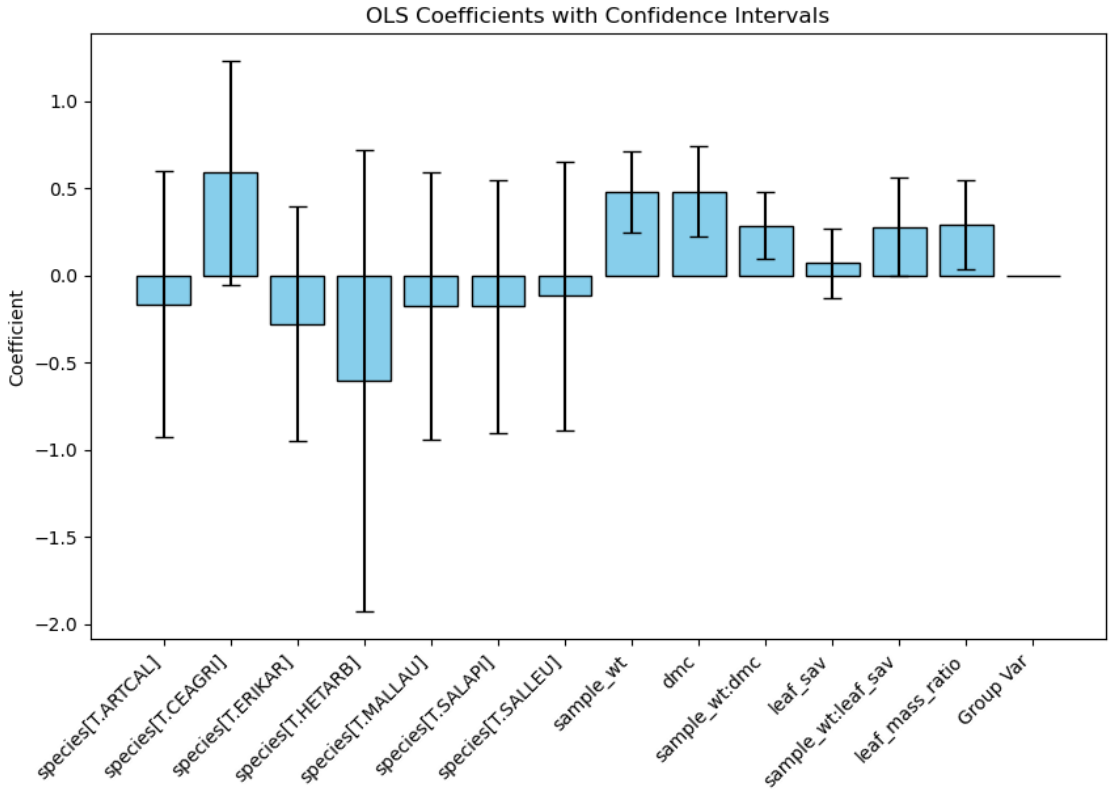


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.5720
Min. group size:	1	Log-Likelihood:	-184.6546
Max. group size:	11	Converged:	No
Mean group size:	3.0		

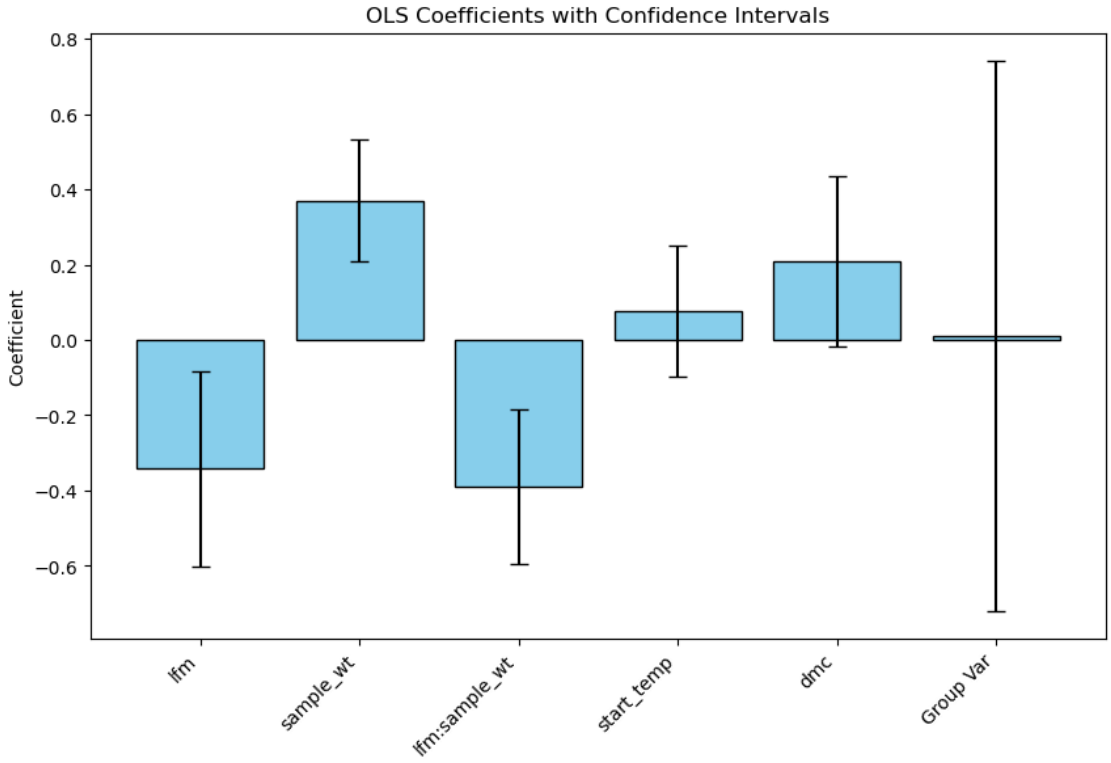
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.060	0.303	0.197	0.844	-0.534	0.653
species[T.ARTCAL]	-0.166	0.390	-0.425	0.671	-0.931	0.599
species[T.CEAGRI]	0.588	0.327	1.796	0.073	-0.054	1.230
species[T.ERIKAR]	-0.278	0.342	-0.811	0.417	-0.948	0.393
species[T.HETARB]	-0.605	0.675	-0.896	0.370	-1.929	0.719
species[T.MALLAU]	-0.173	0.392	-0.443	0.658	-0.941	0.594
species[T.SALAPI]	-0.179	0.369	-0.484	0.628	-0.902	0.545
species[T.SALLEU]	-0.117	0.394	-0.298	0.766	-0.890	0.655
sample_wt	0.478	0.118	4.052	0.000	0.247	0.709

```
dmc                 0.482    0.133  3.617 0.000  0.221  0.743
sample_wt:dmc       0.286    0.099  2.887 0.004  0.092  0.480
leaf_sav            0.070    0.101  0.694 0.488 -0.128  0.268
sample_wt:leaf_sav  0.279    0.143  1.953 0.051 -0.001  0.559
leaf_mass_ratio     0.290    0.131  2.214 0.027  0.033  0.546
Group Var           0.000
============================================================
```



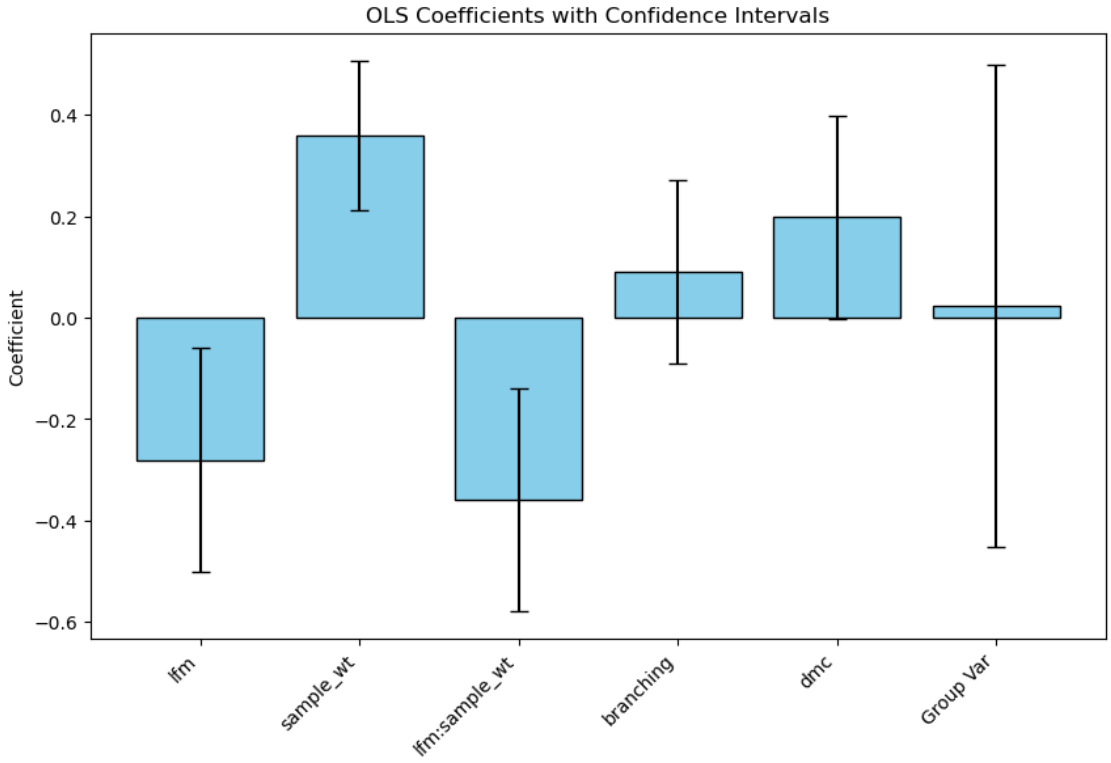

```
         Mixed Linear Model Regression Results
============================================================
Model:             MixedLM Dependent Variable: fd
No. Observations:  162     Method:             ML
No. Groups:        54      Scale:              0.6246
Min. group size:   1       Log-Likelihood:     -192.6937
Max. group size:   11      Converged:          No
Mean group size:   3.0
------------------------------------------------------------
              Coef.  Std.Err.    z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept     -0.079    0.084 -0.947 0.344 -0.243  0.085
lfm           -0.342    0.133 -2.579 0.010 -0.601 -0.082
```

```
sample_wt      0.370    0.082  4.492 0.000  0.209  0.532
lfm:sample_wt -0.390    0.105 -3.713 0.000 -0.596 -0.184
start_temp     0.078    0.089  0.881 0.378 -0.096  0.252
dmc            0.210    0.116  1.814 0.070 -0.017  0.436
Group Var      0.007    0.295
============================================================
```



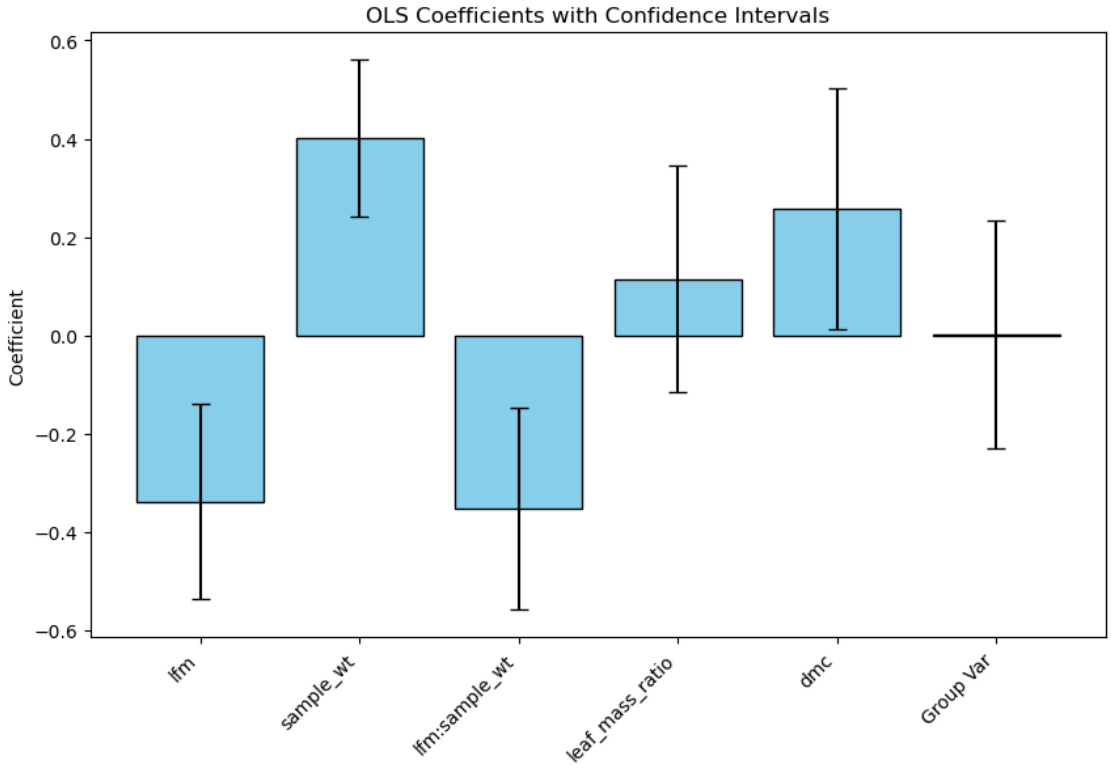

```
         Mixed Linear Model Regression Results
============================================================
Model:             MixedLM Dependent Variable: fd
No. Observations:  162     Method:             ML
No. Groups:        54      Scale:              0.6179
Min. group size:   1       Log-Likelihood:     -192.7140
Max. group size:   11      Converged:          No
Mean group size:   3.0
------------------------------------------------------------
              Coef.  Std.Err.    z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept     -0.071    0.072 -0.989 0.323 -0.213  0.070
lfm           -0.281    0.113 -2.490 0.013 -0.502 -0.060
sample_wt      0.360    0.075  4.785 0.000  0.213  0.508
lfm:sample_wt -0.359    0.112 -3.218 0.001 -0.578 -0.140
```

```
branching       0.091    0.092  0.985 0.325 -0.090  0.271
dmc             0.198    0.102  1.942 0.052 -0.002  0.398
Group Var       0.015    0.191
=====================================================
```



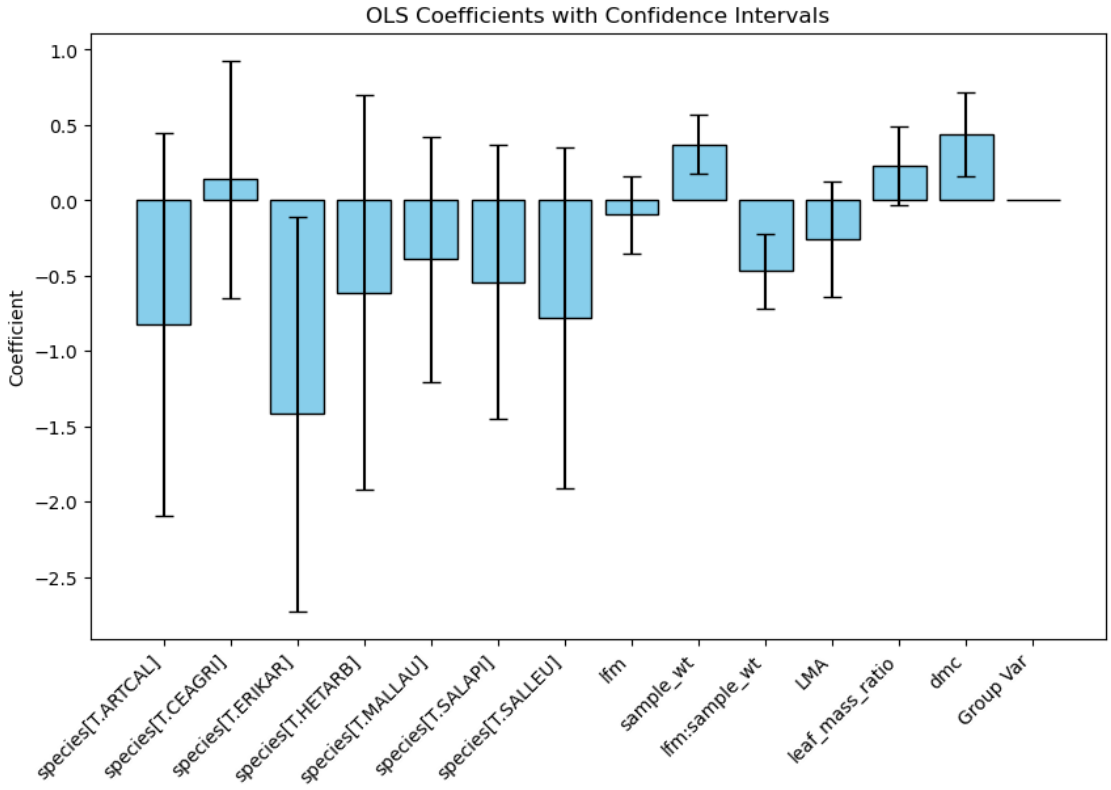

```
          Mixed Linear Model Regression Results
============================================================
Model:             MixedLM  Dependent Variable:  fd
No. Observations:  162      Method:              ML
No. Groups:        54       Scale:               0.6311
Min. group size:   1        Log-Likelihood:      -192.7247
Max. group size:   11       Converged:           Yes
Mean group size:   3.0
------------------------------------------------------------
                Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept       -0.065    0.068 -0.952 0.341 -0.199  0.069
lfm             -0.338    0.101 -3.349 0.001 -0.536 -0.140
sample_wt        0.401    0.081  4.937 0.000  0.242  0.560
lfm:sample_wt   -0.354    0.105 -3.380 0.001 -0.559 -0.149
leaf_mass_ratio  0.115    0.118  0.976 0.329 -0.116  0.345
dmc              0.257    0.125  2.053 0.040  0.012  0.502
```

```
Group Var         0.001    0.094
============================================================
```



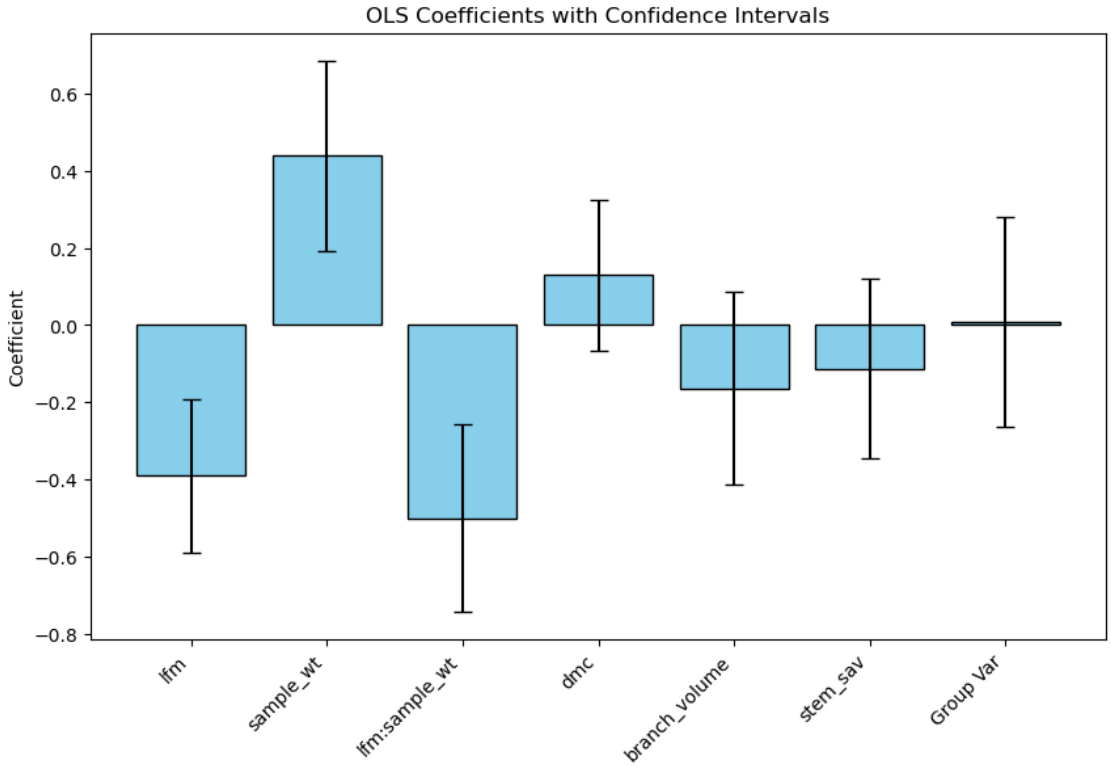

```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5718
Min. group size:     1        Log-Likelihood:      -184.7321
Max. group size:     11       Converged:           No
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept          0.524    0.437  1.198 0.231 -0.333  1.381
species[T.ARTCAL] -0.824    0.647 -1.273 0.203 -2.092  0.444
species[T.CEAGRI]  0.140    0.402  0.349 0.727 -0.648  0.928
species[T.ERIKAR] -1.417    0.668 -2.121 0.034 -2.727 -0.107
species[T.HETARB] -0.611    0.667 -0.917 0.359 -1.917  0.696
species[T.MALLAU] -0.392    0.414 -0.948 0.343 -1.203  0.419
species[T.SALAPI] -0.543    0.465 -1.170 0.242 -1.454  0.367
species[T.SALLEU] -0.782    0.578 -1.354 0.176 -1.915  0.350
```

```
lfm               -0.097    0.133 -0.733 0.464 -0.357  0.163
sample_wt          0.370    0.100  3.697 0.000  0.174  0.565
lfm:sample_wt     -0.471    0.127 -3.709 0.000 -0.720 -0.222
LMA               -0.258    0.194 -1.325 0.185 -0.639  0.124
leaf_mass_ratio    0.228    0.132  1.727 0.084 -0.031  0.488
dmc                0.437    0.143  3.061 0.002  0.157  0.718
Group Var          0.001
============================================================
```



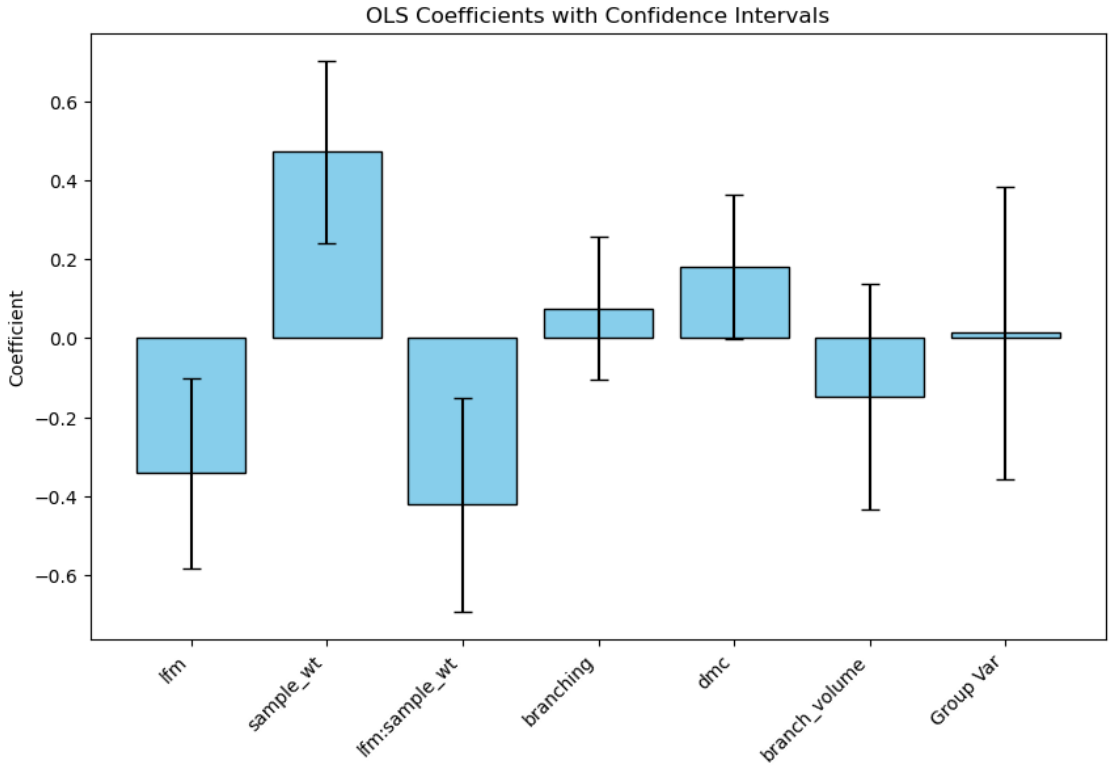

```
         Mixed Linear Model Regression Results
============================================================
Model:             MixedLM Dependent Variable: fd
No. Observations:  162     Method:             ML
No. Groups:        54      Scale:              0.6197
Min. group size:   1       Log-Likelihood:     -191.7419
Max. group size:   11      Converged:          No
Mean group size:   3.0
------------------------------------------------------------
              Coef.  Std.Err.    z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept     -0.103    0.071 -1.453 0.146 -0.242  0.036
```

```
lfm           -0.391    0.101 -3.867 0.000 -0.590 -0.193
sample_wt      0.440    0.126  3.494 0.000  0.193  0.686
lfm:sample_wt -0.501    0.124 -4.047 0.000 -0.743 -0.258
dmc            0.129    0.100  1.292 0.196 -0.067  0.326
branch_volume -0.164    0.128 -1.278 0.201 -0.414  0.087
stem_sav      -0.113    0.119 -0.946 0.344 -0.346  0.121
Group Var      0.005    0.109
============================================================
```



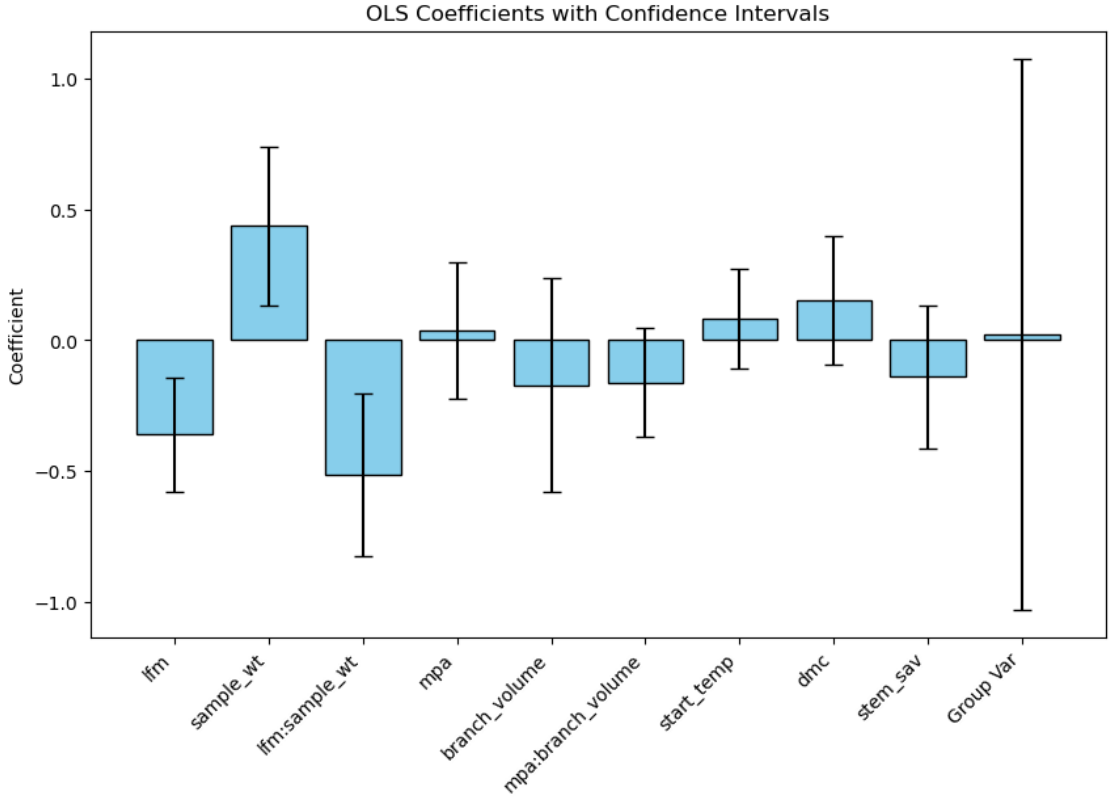

```
         Mixed Linear Model Regression Results
============================================================
Model:             MixedLM Dependent Variable: fd
No. Observations:  162     Method:             ML
No. Groups:        54      Scale:              0.6168
Min. group size:   1       Log-Likelihood:     -191.7708
Max. group size:   11      Converged:          Yes
Mean group size:   3.0
------------------------------------------------------------
              Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept     -0.085    0.073 -1.170 0.242 -0.227  0.057
lfm           -0.342    0.123 -2.787 0.005 -0.582 -0.101
```

```
sample_wt      0.471    0.118  3.999 0.000  0.240  0.702
lfm:sample_wt -0.422    0.138 -3.054 0.002 -0.692 -0.151
branching      0.075    0.092  0.815 0.415 -0.106  0.256
dmc            0.181    0.093  1.949 0.051 -0.001  0.363
branch_volume -0.147    0.146 -1.012 0.311 -0.433  0.138
Group Var      0.008    0.149
============================================================
```



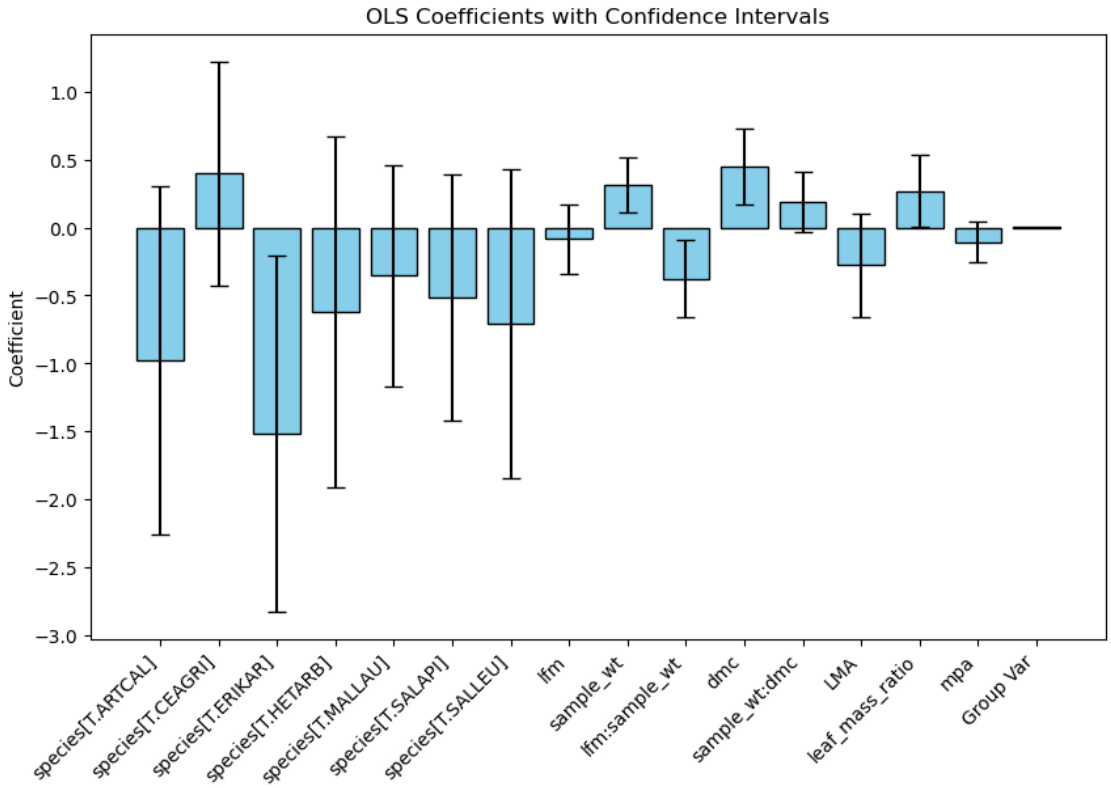

```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5887
Min. group size:     1        Log-Likelihood:      -188.7791
Max. group size:     11       Converged:           No
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept         -0.121    0.111 -1.086 0.277 -0.339  0.097
lfm               -0.361    0.110 -3.270 0.001 -0.578 -0.145
sample_wt          0.436    0.155  2.813 0.005  0.132  0.739
```

```
lfm:sample_wt      -0.515    0.158 -3.260 0.001 -0.825 -0.206
mpa                 0.037    0.133  0.275 0.783 -0.224  0.297
branch_volume      -0.172    0.208 -0.827 0.408 -0.581  0.236
mpa:branch_volume  -0.162    0.106 -1.526 0.127 -0.371  0.046
start_temp          0.083    0.097  0.854 0.393 -0.107  0.273
dmc                 0.154    0.125  1.229 0.219 -0.092  0.400
stem_sav           -0.141    0.141 -1.004 0.315 -0.417  0.134
Group Var           0.014    0.412
============================================================
```



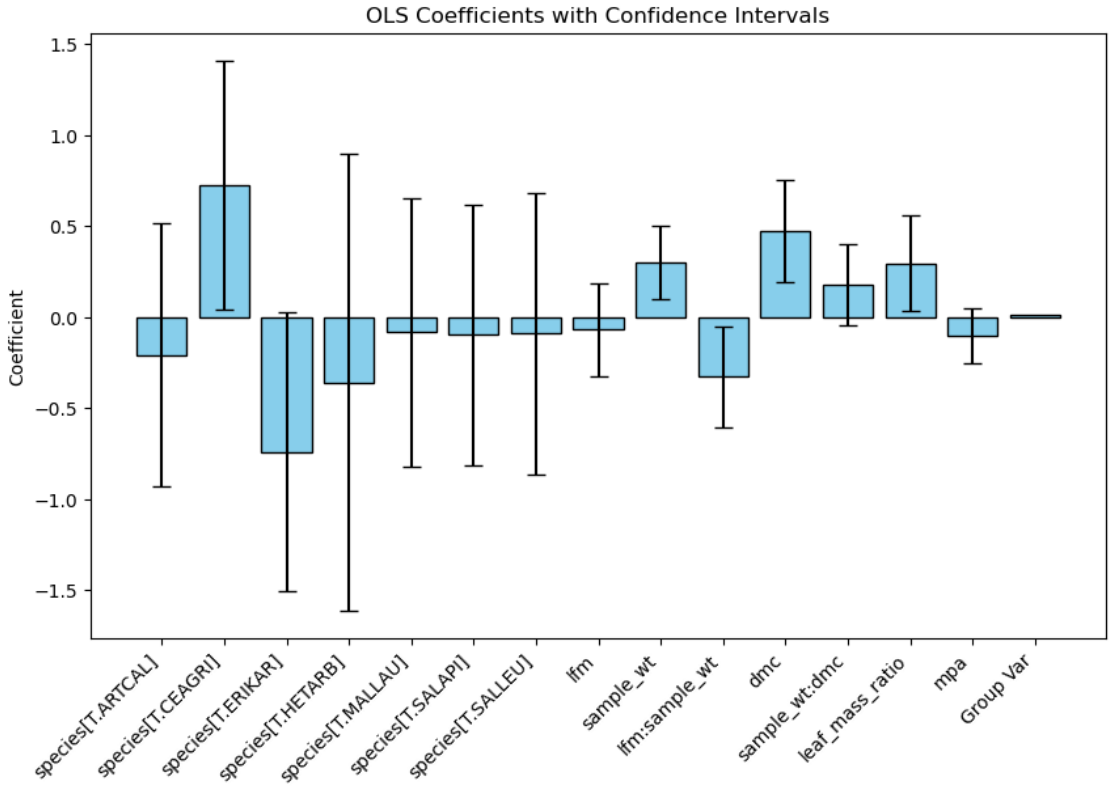

```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5537
Min. group size:     1        Log-Likelihood:      -182.7792
Max. group size:     11       Converged:           No
Mean group size:     3.0
------------------------------------------------------------
                 Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
```

```
Intercept           0.448    0.439  1.020 0.308 -0.413  1.308
species[T.ARTCAL]  -0.979    0.653 -1.499 0.134 -2.258  0.301
species[T.CEAGRI]   0.399    0.421  0.947 0.344 -0.427  1.224
species[T.ERIKAR]  -1.516    0.668 -2.270 0.023 -2.826 -0.207
species[T.HETARB]  -0.623    0.660 -0.943 0.346 -1.917  0.672
species[T.MALLAU]  -0.353    0.415 -0.852 0.394 -1.166  0.459
species[T.SALAPI]  -0.512    0.462 -1.109 0.267 -1.417  0.393
species[T.SALLEU]  -0.708    0.580 -1.220 0.223 -1.846  0.430
lfm                -0.085    0.132 -0.640 0.522 -0.344  0.175
sample_wt           0.317    0.102  3.093 0.002  0.116  0.518
lfm:sample_wt      -0.378    0.145 -2.603 0.009 -0.662 -0.093
dmc                 0.453    0.142  3.184 0.001  0.174  0.732
sample_wt:dmc       0.188    0.113  1.653 0.098 -0.035  0.410
LMA                -0.277    0.193 -1.434 0.151 -0.656  0.102
leaf_mass_ratio     0.270    0.134  2.012 0.044  0.007  0.533
mpa                -0.105    0.076 -1.378 0.168 -0.255  0.044
Group Var           0.006
============================================================
```




```
           Mixed Linear Model Regression Results
============================================================
```

```
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5609
Min. group size:     1        Log-Likelihood:      -183.7803
Max. group size:     11       Converged:           No
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept         -0.027    0.289 -0.094 0.925 -0.593  0.539
species[T.ARTCAL] -0.209    0.369 -0.567 0.571 -0.932  0.514
species[T.CEAGRI]  0.724    0.350  2.069 0.039  0.038  1.410
species[T.ERIKAR] -0.741    0.391 -1.893 0.058 -1.507  0.026
species[T.HETARB] -0.358    0.639 -0.560 0.575 -1.610  0.895
species[T.MALLAU] -0.084    0.375 -0.224 0.823 -0.818  0.650
species[T.SALAPI] -0.099    0.367 -0.269 0.788 -0.818  0.620
species[T.SALLEU] -0.091    0.394 -0.232 0.816 -0.863  0.680
lfm               -0.069    0.130 -0.531 0.595 -0.323  0.185
sample_wt          0.299    0.102  2.932 0.003  0.099  0.499
lfm:sample_wt     -0.328    0.141 -2.323 0.020 -0.605 -0.051
dmc                0.471    0.142  3.307 0.001  0.192  0.750
sample_wt:dmc      0.179    0.114  1.578 0.115 -0.043  0.402
leaf_mass_ratio    0.294    0.134  2.188 0.029  0.031  0.557
mpa               -0.104    0.076 -1.365 0.172 -0.254  0.045
Group Var          0.005
============================================================
```

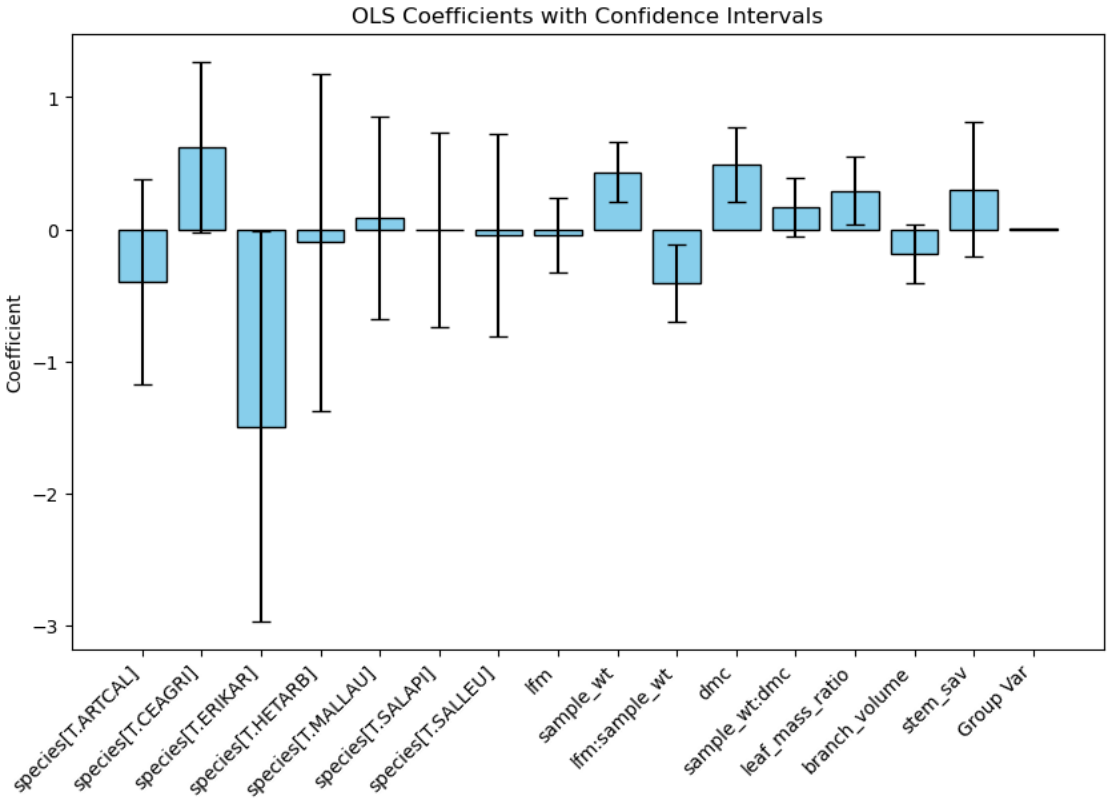


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.5556
Min. group size:	1	Log-Likelihood:	-182.7869
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

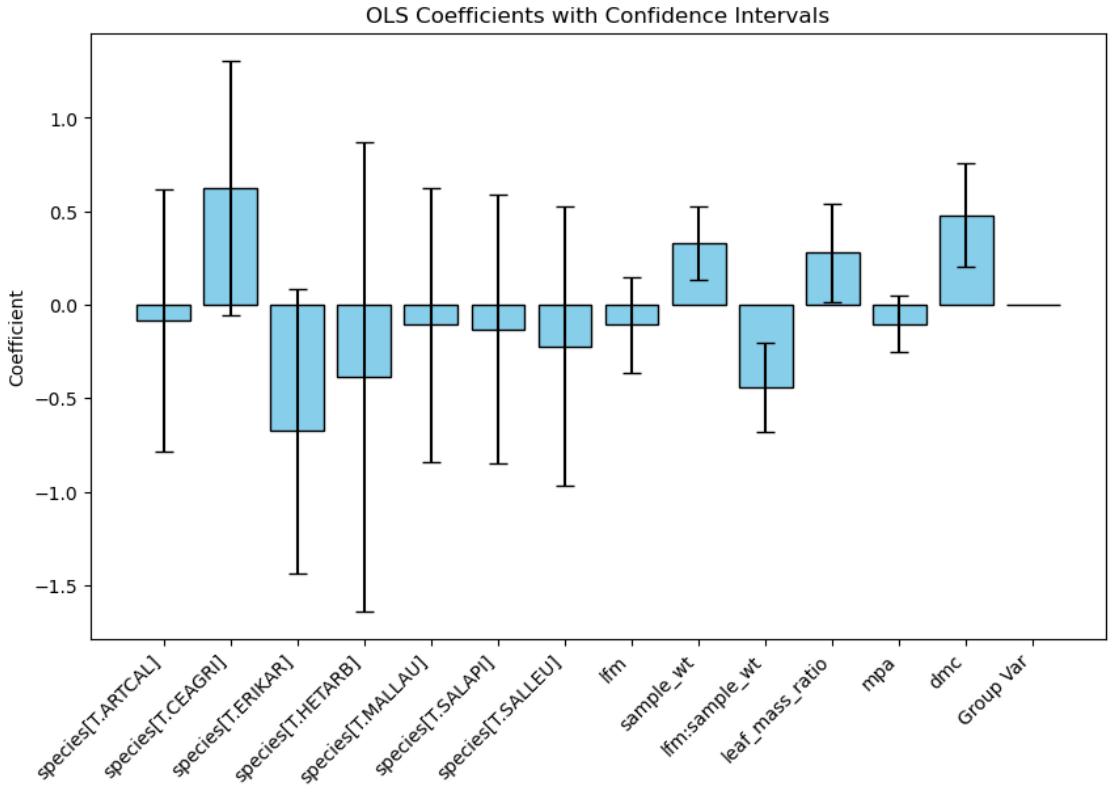
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.112	0.322	0.347	0.729	-0.520	0.743
species[T.ARTCAL]	-0.399	0.395	-1.012	0.312	-1.173	0.374
species[T.CEAGRI]	0.622	0.331	1.882	0.060	-0.026	1.270
species[T.ERIKAR]	-1.492	0.752	-1.985	0.047	-2.966	-0.019
species[T.HETARB]	-0.097	0.651	-0.149	0.881	-1.373	1.179
species[T.MALLAU]	0.087	0.392	0.221	0.825	-0.681	0.855
species[T.SALAPI]	-0.004	0.374	-0.012	0.990	-0.737	0.728
species[T.SALLEU]	-0.048	0.390	-0.123	0.902	-0.813	0.717
lfm	-0.046	0.143	-0.321	0.748	-0.327	0.235
sample_wt	0.432	0.116	3.735	0.000	0.205	0.659
lfm:sample_wt	-0.407	0.151	-2.699	0.007	-0.702	-0.111

```
dmc                0.491    0.144  3.401 0.001  0.208  0.774
sample_wt:dmc      0.164    0.114  1.439 0.150 -0.059  0.386
leaf_mass_ratio    0.293    0.134  2.194 0.028  0.031  0.555
branch_volume     -0.188    0.112 -1.669 0.095 -0.408  0.033
stem_sav           0.300    0.260  1.152 0.249 -0.210  0.810
Group Var          0.004
============================================================
```



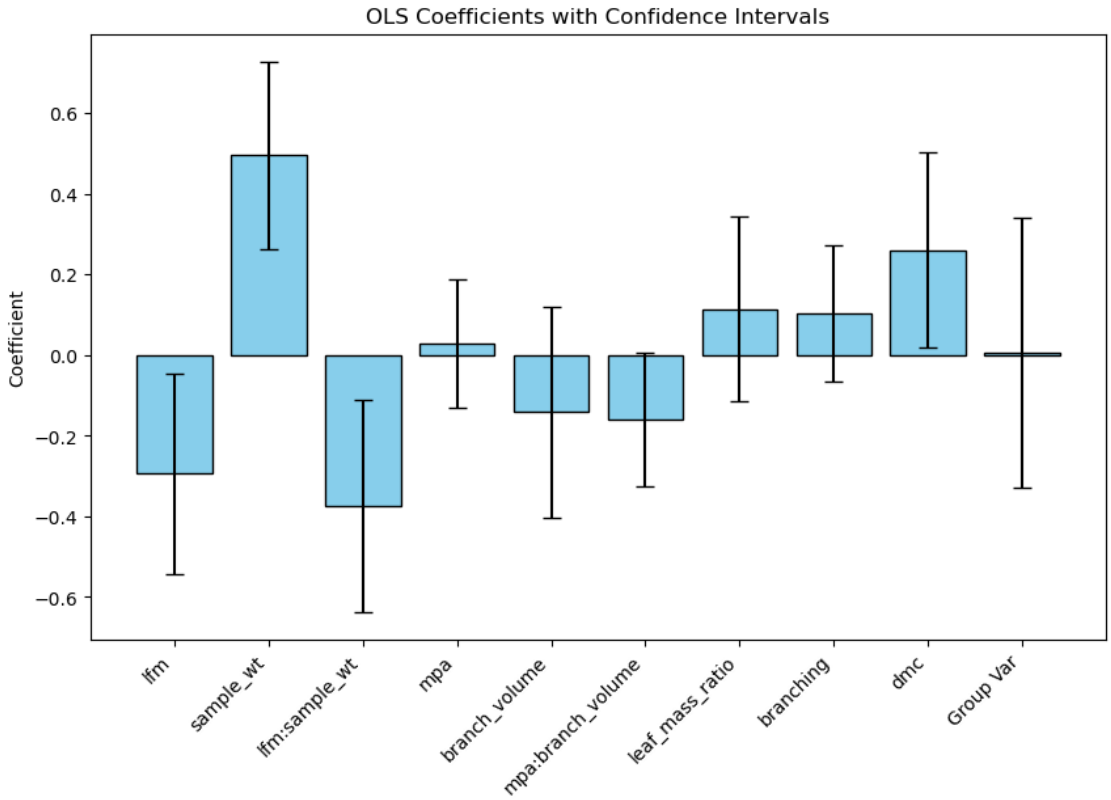

```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5717
Min. group size:     1        Log-Likelihood:      -184.7924
Max. group size:     11       Converged:           No
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept          0.032    0.286  0.111 0.912 -0.529  0.592
species[T.ARTCAL] -0.082    0.358 -0.230 0.818 -0.785  0.620
```

```
species[T.CEAGRI]  0.624    0.348  1.790 0.073 -0.059  1.307
species[T.ERIKAR] -0.675    0.388 -1.738 0.082 -1.436  0.086
species[T.HETARB] -0.383    0.641 -0.599 0.549 -1.639  0.872
species[T.MALLAU] -0.109    0.372 -0.292 0.770 -0.839  0.621
species[T.SALAPI] -0.130    0.366 -0.356 0.722 -0.847  0.587
species[T.SALLEU] -0.223    0.381 -0.584 0.559 -0.970  0.525
lfm               -0.107    0.131 -0.816 0.414 -0.363  0.150
sample_wt          0.328    0.101  3.260 0.001  0.131  0.526
lfm:sample_wt     -0.442    0.122 -3.616 0.000 -0.682 -0.202
leaf_mass_ratio    0.278    0.134  2.078 0.038  0.016  0.540
mpa               -0.105    0.077 -1.361 0.173 -0.255  0.046
dmc                0.479    0.142  3.362 0.001  0.200  0.758
Group Var          0.001
============================================================
```



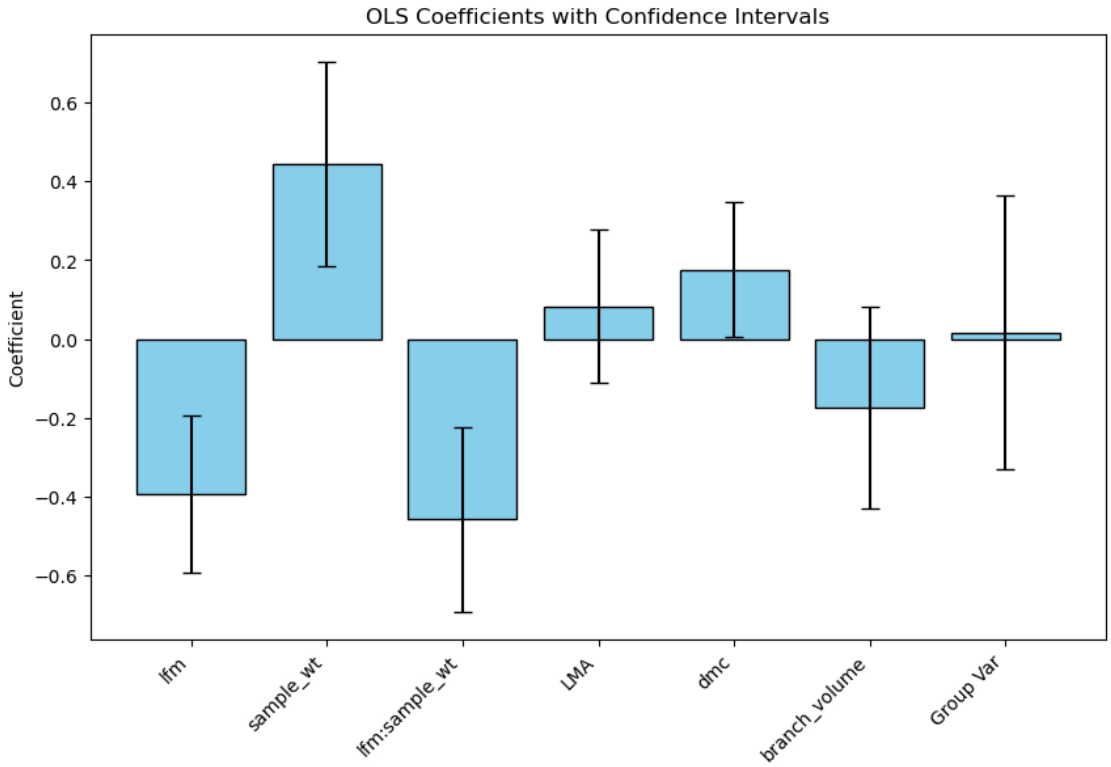

```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5996
Min. group size:     1        Log-Likelihood:      -188.8162
```

```
Max. group size:     11       Converged:           No
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept         -0.081    0.071 -1.138 0.255 -0.221  0.059
lfm               -0.295    0.128 -2.310 0.021 -0.545 -0.045
sample_wt          0.496    0.119  4.180 0.000  0.263  0.729
lfm:sample_wt     -0.374    0.134 -2.797 0.005 -0.636 -0.112
mpa                0.028    0.081  0.348 0.728 -0.131  0.188
branch_volume     -0.141    0.134 -1.054 0.292 -0.403  0.121
mpa:branch_volume -0.160    0.084 -1.895 0.058 -0.325  0.006
leaf_mass_ratio    0.114    0.116  0.980 0.327 -0.114  0.342
branching          0.102    0.086  1.186 0.236 -0.067  0.271
dmc                0.260    0.123  2.113 0.035  0.019  0.502
Group Var          0.003    0.132
============================================================
```



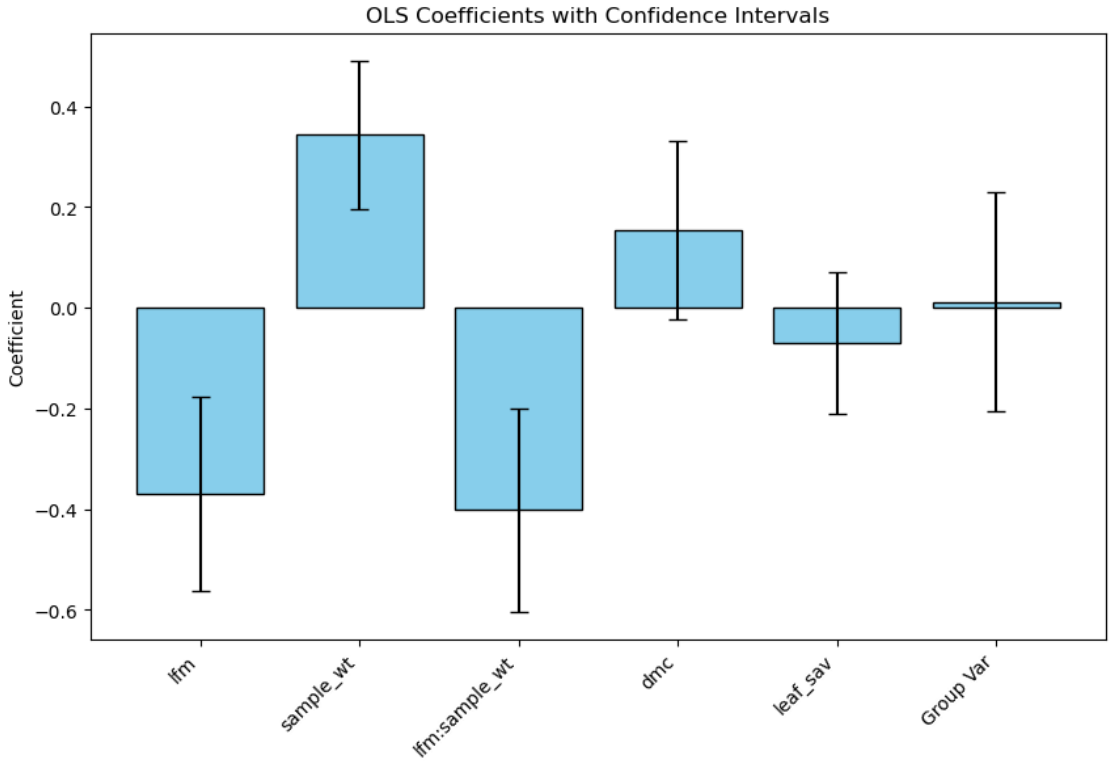

```
         Mixed Linear Model Regression Results
============================================================
Model:             MixedLM Dependent Variable: fd
```

```
No. Observations:  162     Method:             ML
No. Groups:        54      Scale:              0.6159
Min. group size:   1       Log-Likelihood:     -191.8216
Max. group size:   11      Converged:          Yes
Mean group size:   3.0
-----------------------------------------------------------
              Coef.  Std.Err.   z    P>|z| [0.025 0.975]
-----------------------------------------------------------
Intercept     -0.089    0.073 -1.224 0.221 -0.232  0.054
lfm           -0.395    0.101 -3.900 0.000 -0.593 -0.196
sample_wt      0.446    0.132  3.368 0.001  0.186  0.705
lfm:sample_wt -0.460    0.119 -3.846 0.000 -0.694 -0.225
LMA            0.083    0.100  0.830 0.407 -0.113  0.279
dmc            0.176    0.088  2.001 0.045  0.004  0.348
branch_volume -0.176    0.131 -1.342 0.180 -0.433  0.081
Group Var      0.010    0.139
===========================================================
```



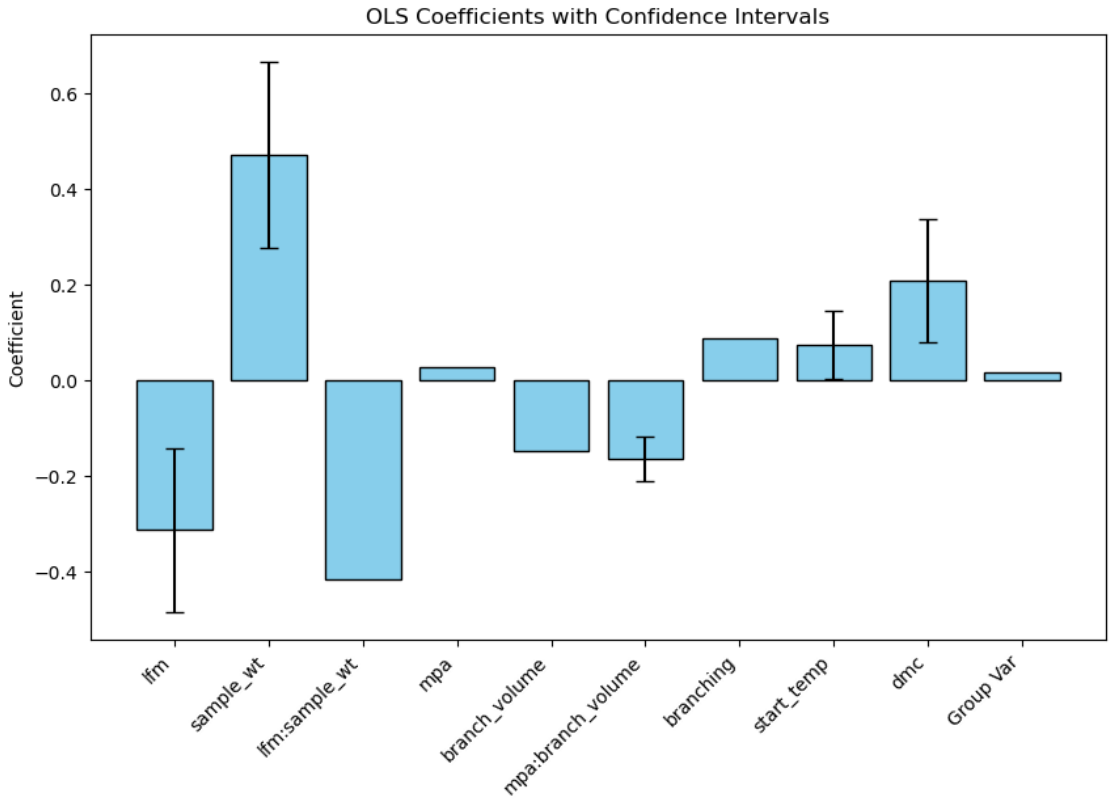

```
         Mixed Linear Model Regression Results
===========================================================
Model:             MixedLM Dependent Variable: fd
No. Observations:  162     Method:             ML
```

```
No. Groups:         54      Scale:               0.6257
Min. group size:    1       Log-Likelihood:      -192.8294
Max. group size:    11      Converged:           No
Mean group size:    3.0
-----------------------------------------------------------
               Coef.  Std.Err.    z    P>|z| [0.025 0.975]
-----------------------------------------------------------
Intercept      -0.078    0.068 -1.136 0.256 -0.212  0.056
lfm            -0.370    0.099 -3.754 0.000 -0.563 -0.177
sample_wt       0.344    0.075  4.563 0.000  0.196  0.491
lfm:sample_wt  -0.402    0.103 -3.910 0.000 -0.603 -0.200
dmc             0.154    0.090  1.709 0.087 -0.023  0.331
leaf_sav       -0.069    0.072 -0.963 0.336 -0.210  0.072
Group Var       0.007    0.088
===========================================================
```



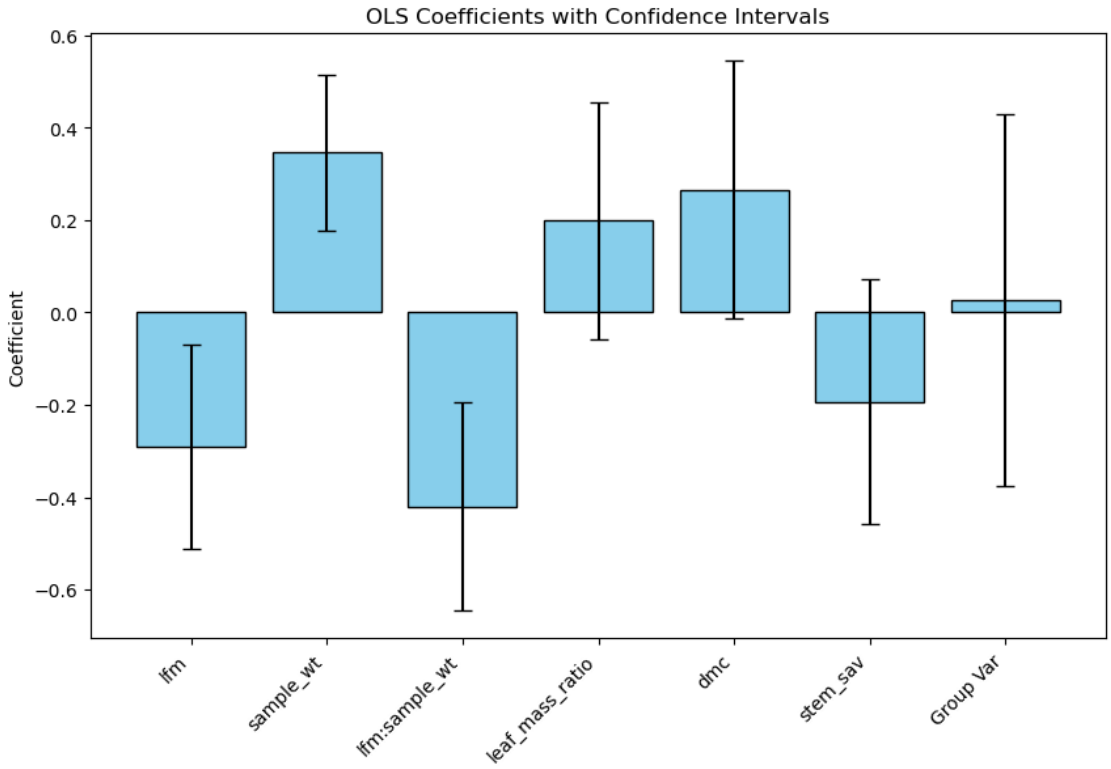

```
           Mixed Linear Model Regression Results
============================================================
Model:               MixedLM  Dependent Variable:  fd
No. Observations:    162      Method:              ML
No. Groups:          54       Scale:               0.5936
Min. group size:     1        Log-Likelihood:      -188.8366
```

```
Max. group size:     11       Converged:           No
Mean group size:     3.0
------------------------------------------------------------
                  Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept         -0.097
lfm               -0.314    0.087 -3.606 0.000 -0.484 -0.143
sample_wt          0.471    0.099  4.731 0.000  0.276  0.666
lfm:sample_wt     -0.418
mpa                0.028
branch_volume     -0.148
mpa:branch_volume -0.165    0.023 -7.109 0.000 -0.211 -0.120
branching          0.088
start_temp         0.073    0.036  2.050 0.040  0.003  0.143
dmc                0.208    0.066  3.153 0.002  0.079  0.337
Group Var          0.009
============================================================
```



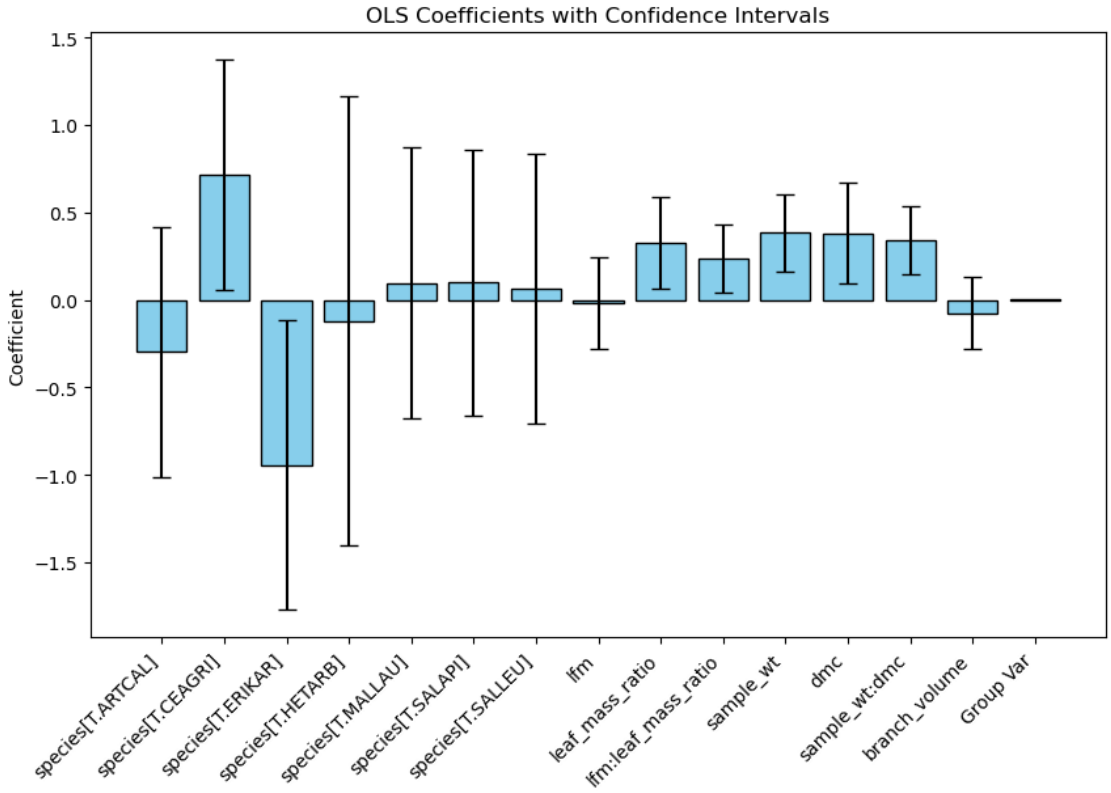

```
          Mixed Linear Model Regression Results
============================================================
Model:             MixedLM  Dependent Variable:  fd
```

```
No. Observations:  162      Method:              ML
No. Groups:        54       Scale:               0.6096
Min. group size:   1        Log-Likelihood:      -191.8441
Max. group size:   11       Converged:           No
Mean group size:   3.0
------------------------------------------------------------
                Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept       -0.085    0.072 -1.177 0.239 -0.225  0.056
lfm             -0.290    0.113 -2.565 0.010 -0.511 -0.068
sample_wt        0.346    0.087  3.991 0.000  0.176  0.516
lfm:sample_wt   -0.421    0.115 -3.661 0.000 -0.647 -0.196
leaf_mass_ratio  0.199    0.131  1.520 0.129 -0.058  0.456
dmc              0.266    0.142  1.871 0.061 -0.013  0.544
stem_sav        -0.193    0.136 -1.425 0.154 -0.459  0.072
Group Var        0.016    0.161
============================================================
```




```
            Mixed Linear Model Regression Results
============================================================
Model:               MixedLM   Dependent Variable:   fd
No. Observations:    162       Method:               ML
```

```
No. Groups:          54        Scale:                0.5625
Min. group size:     1         Log-Likelihood:       -183.8452
Max. group size:     11        Converged:            Yes
Mean group size:     3.0
-------------------------------------------------------------
                    Coef.  Std.Err.   z    P>|z| [0.025 0.975]
-------------------------------------------------------------
Intercept           -0.136    0.293 -0.463 0.644 -0.710  0.439
species[T.ARTCAL]   -0.296    0.364 -0.813 0.416 -1.010  0.418
species[T.CEAGRI]    0.715    0.335  2.134 0.033  0.058  1.371
species[T.ERIKAR]   -0.945    0.422 -2.239 0.025 -1.773 -0.118
species[T.HETARB]   -0.121    0.655 -0.185 0.854 -1.404  1.162
species[T.MALLAU]    0.096    0.395  0.243 0.808 -0.677  0.869
species[T.SALAPI]    0.098    0.388  0.253 0.801 -0.663  0.859
species[T.SALLEU]    0.064    0.394  0.163 0.870 -0.708  0.837
lfm                 -0.017    0.134 -0.128 0.898 -0.280  0.246
leaf_mass_ratio      0.326    0.135  2.421 0.015  0.062  0.591
lfm:leaf_mass_ratio  0.235    0.100  2.348 0.019  0.039  0.431
sample_wt            0.383    0.113  3.379 0.001  0.161  0.606
dmc                  0.380    0.148  2.575 0.010  0.091  0.669
sample_wt:dmc        0.342    0.099  3.443 0.001  0.147  0.537
branch_volume       -0.075    0.104 -0.715 0.474 -0.280  0.130
Group Var            0.004
=============================================================
```



6 Temp Change

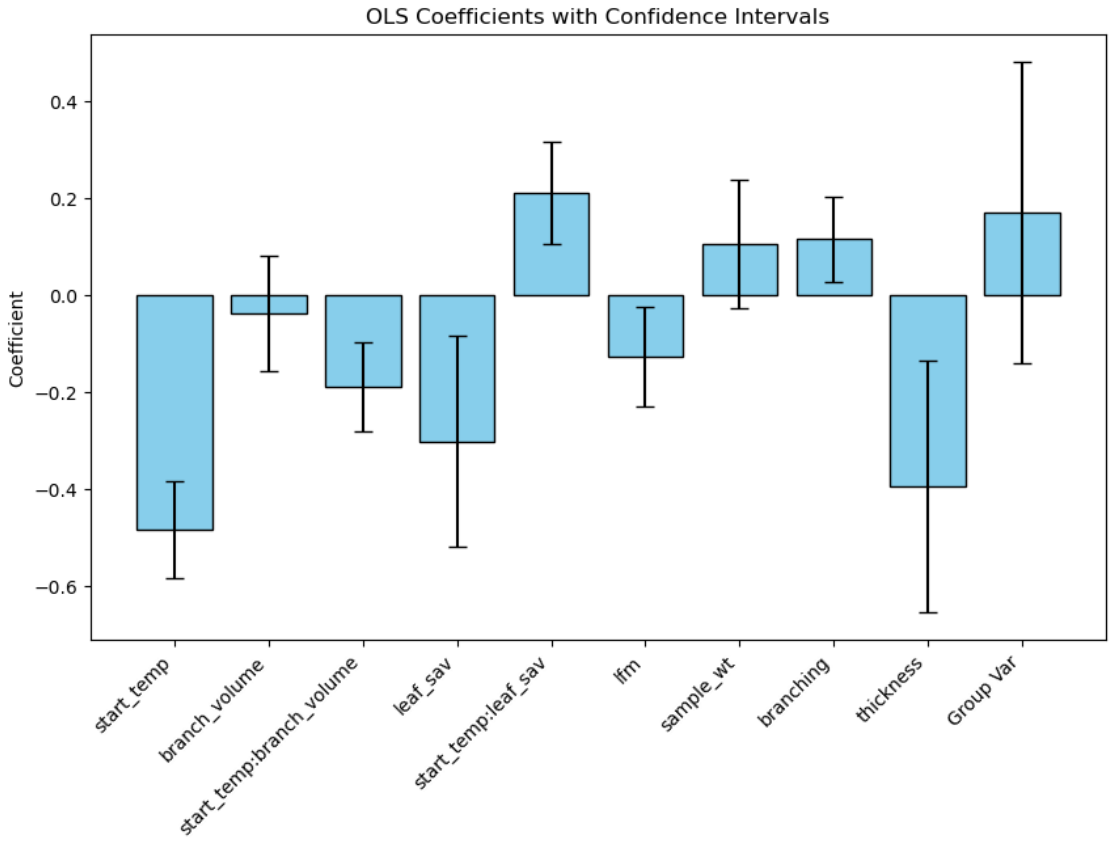
[9]:
```
AIC_iterator(flam, cols_use, Y_VAR='temp_change',
             minnumsingle=mns, maxnumsingle=mxs, minnumint=mni, maxnumint=mxi)
```

```
Columns present in sig. interaction terms: {'sample_wt', 'branch_volume',
'branching', 'thickness', 'LMA', 'leaf_sav', 'lfm', 'start_temp', 'mpa',
'leaf_mass_ratio', 'dmc', 'species'}

Total Num. Cols : Num. Sig. Int. Cols;  13 : 12

Significant Interactions:
('lfm', 'start_temp')
('lfm', 'dmc')
('LMA', 'sample_wt')
('sample_wt', 'branching')
('sample_wt', 'start_temp')
('sample_wt', 'branch_volume')
('leaf_mass_ratio', 'branch_volume')
('branching', 'start_temp')
```

```
('branching', 'branch_volume')
('mpa', 'thickness')
('start_temp', 'branch_volume')
('start_temp', 'leaf_sav')
('start_temp', 'thickness')
('start_temp', 'species')
('thickness', 'species')

Number of formulas: 40640


temp_change ~ start_temp*branch_volume + start_temp*leaf_sav + lfm + sample_wt +
branching + thickness
temp_change ~ lfm*start_temp + start_temp*branch_volume + sample_wt + branching
temp_change ~ lfm*start_temp + start_temp*branch_volume + branching
temp_change ~ start_temp*branch_volume + start_temp*leaf_sav + lfm + branching +
thickness
temp_change ~ lfm*start_temp + start_temp*branch_volume + sample_wt + branching
+ mpa
temp_change ~ lfm*start_temp + start_temp*branch_volume + LMA + sample_wt +
branching
temp_change ~ lfm*start_temp + start_temp*branch_volume + sample_wt + branching
+ stem_sav
temp_change ~ lfm*start_temp + start_temp*branch_volume + branching + mpa
temp_change ~ lfm*start_temp + start_temp*branch_volume + LMA + sample_wt +
branching + mpa
temp_change ~ lfm*start_temp + start_temp*branch_volume + LMA + branching
temp_change ~ lfm*start_temp + start_temp*branch_volume + sample_wt + branching
+ dmc
temp_change ~ lfm*start_temp + start_temp*branch_volume + sample_wt + branching
+ thickness
temp_change ~ lfm*start_temp + start_temp*branch_volume + leaf_mass_ratio +
branching
temp_change ~ start_temp*branch_volume + start_temp*leaf_sav + lfm + branching +
dmc + thickness
temp_change ~ start_temp*branch_volume + start_temp*leaf_sav + lfm + LMA +
branching + thickness
temp_change ~ lfm*start_temp + start_temp*branch_volume + branching + stem_sav
temp_change ~ lfm*start_temp + start_temp*branch_volume + sample_wt + branching
+ mpa + stem_sav
temp_change ~ lfm*start_temp + start_temp*branch_volume + sample_wt + branching
+ leaf_sav


               Mixed Linear Model Regression Results
================================================================
Model:                MixedLM    Dependent Variable:    temp_change
No. Observations:     162        Method:                ML
```

No. Groups:	54	Scale:	0.1751
Min. group size:	1	Log-Likelihood:	-99.2963
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

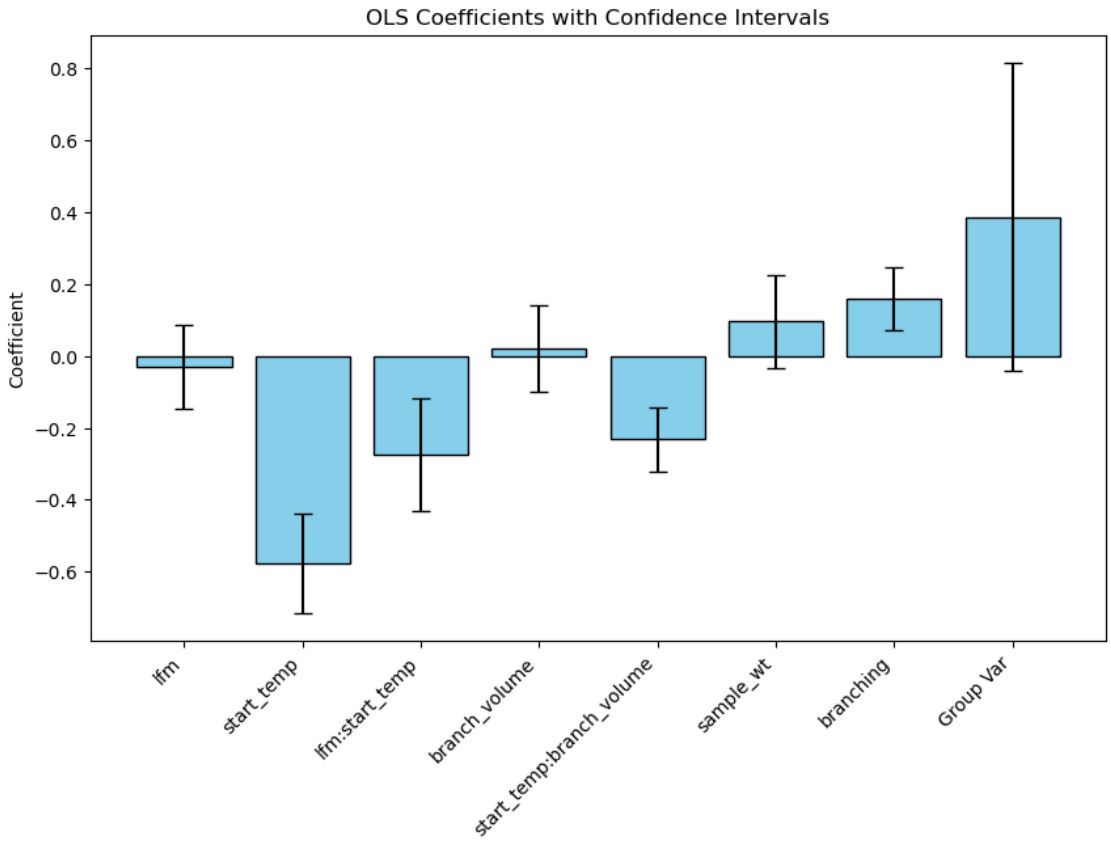
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.148	0.047	-3.135	0.002	-0.241	-0.056
start_temp	-0.483	0.051	-9.409	0.000	-0.584	-0.382
branch_volume	-0.037	0.061	-0.605	0.545	-0.156	0.082
start_temp:branch_volume	-0.189	0.047	-4.046	0.000	-0.280	-0.097
leaf_sav	-0.301	0.112	-2.701	0.007	-0.520	-0.083
start_temp:leaf_sav	0.211	0.053	3.956	0.000	0.107	0.316
lfm	-0.126	0.053	-2.391	0.017	-0.230	-0.023
sample_wt	0.106	0.068	1.572	0.116	-0.026	0.239
branching	0.116	0.045	2.566	0.010	0.027	0.205
thickness	-0.395	0.132	-2.982	0.003	-0.654	-0.135
Group Var	0.030	0.066				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1613
Min. group size:	1	Log-Likelihood:	-101.3153
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

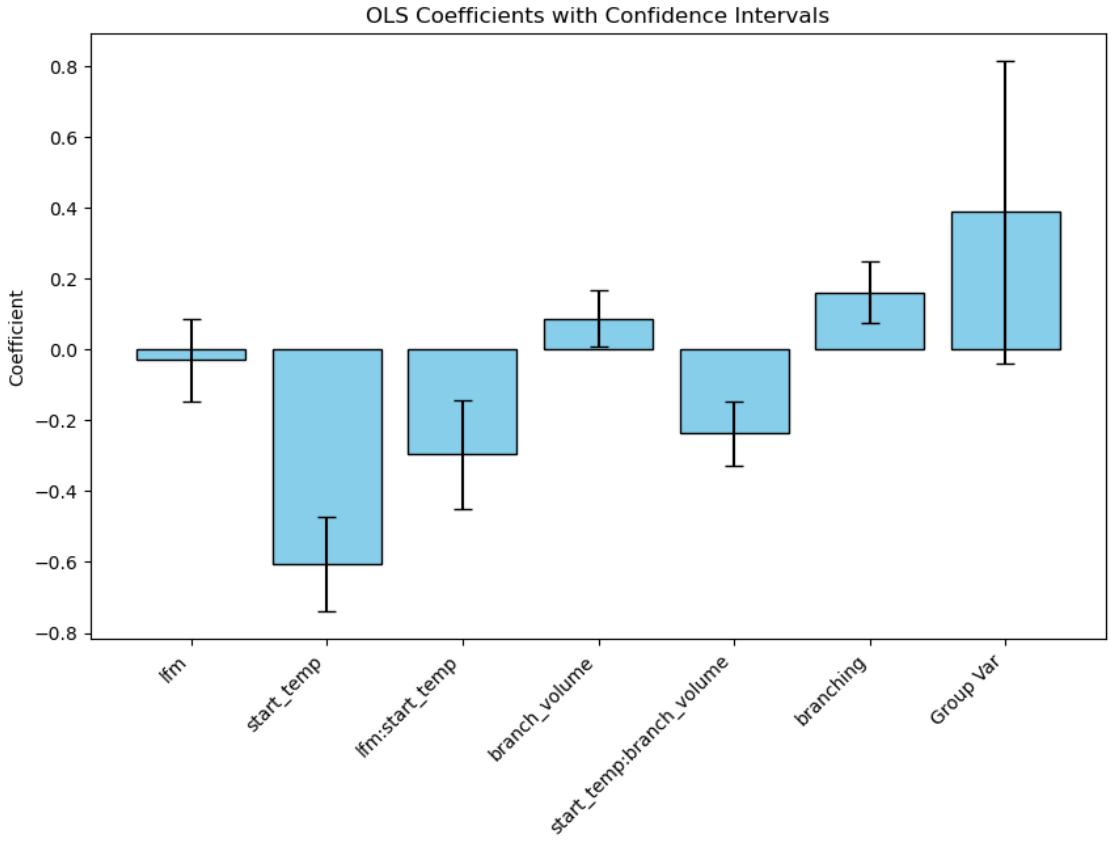
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.044	0.050	-0.883	0.377	-0.143	0.054
lfm	-0.032	0.060	-0.539	0.590	-0.149	0.085
start_temp	-0.577	0.070	-8.192	0.000	-0.714	-0.439
lfm:start_temp	-0.274	0.079	-3.447	0.001	-0.429	-0.118
branch_volume	0.021	0.062	0.345	0.730	-0.099	0.142
start_temp:branch_volume	-0.232	0.046	-5.055	0.000	-0.321	-0.142
sample_wt	0.096	0.066	1.446	0.148	-0.034	0.225
branching	0.158	0.045	3.539	0.000	0.071	0.246
Group Var	0.062	0.088				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1632
Min. group size:	1	Log-Likelihood:	-102.3536
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.041	0.051	-0.806	0.420	-0.140	0.059
lfm	-0.030	0.060	-0.507	0.612	-0.147	0.087
start_temp	-0.605	0.068	-8.878	0.000	-0.738	-0.471
lfm:start_temp	-0.295	0.078	-3.770	0.000	-0.449	-0.142
branch_volume	0.088	0.041	2.123	0.034	0.007	0.168
start_temp:branch_volume	-0.237	0.046	-5.153	0.000	-0.327	-0.147
branching	0.162	0.045	3.595	0.000	0.073	0.250
Group Var	0.063	0.088				

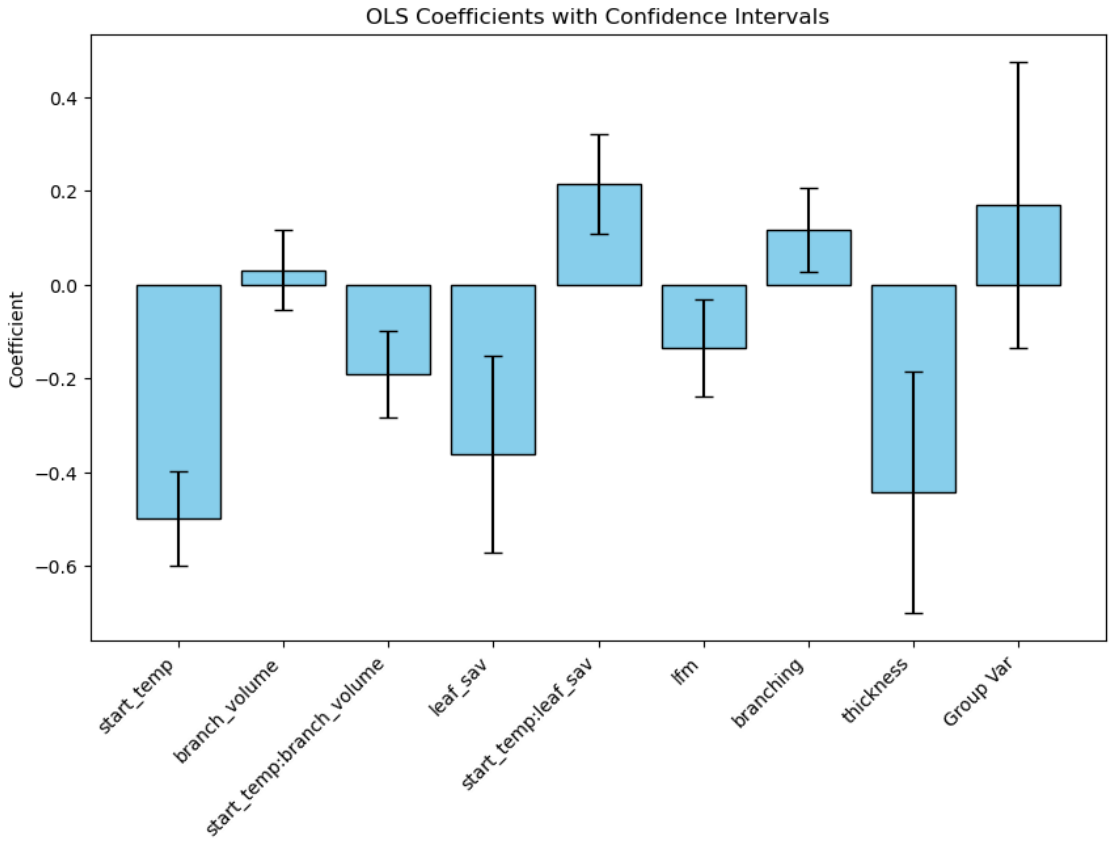


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1779
Min. group size:	1	Log-Likelihood:	-100.5245
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.149	0.048	-3.140	0.002	-0.242	-0.056
start_temp	-0.498	0.051	-9.780	0.000	-0.598	-0.398
branch_volume	0.031	0.043	0.704	0.482	-0.055	0.116
start_temp:branch_volume	-0.191	0.047	-4.066	0.000	-0.283	-0.099
leaf_sav	-0.360	0.107	-3.365	0.001	-0.570	-0.150
start_temp:leaf_sav	0.216	0.054	3.988	0.000	0.110	0.322
lfm	-0.134	0.053	-2.542	0.011	-0.238	-0.031
branching	0.117	0.046	2.568	0.010	0.028	0.206
thickness	-0.442	0.131	-3.364	0.001	-0.699	-0.184
Group Var	0.030	0.066				

==========



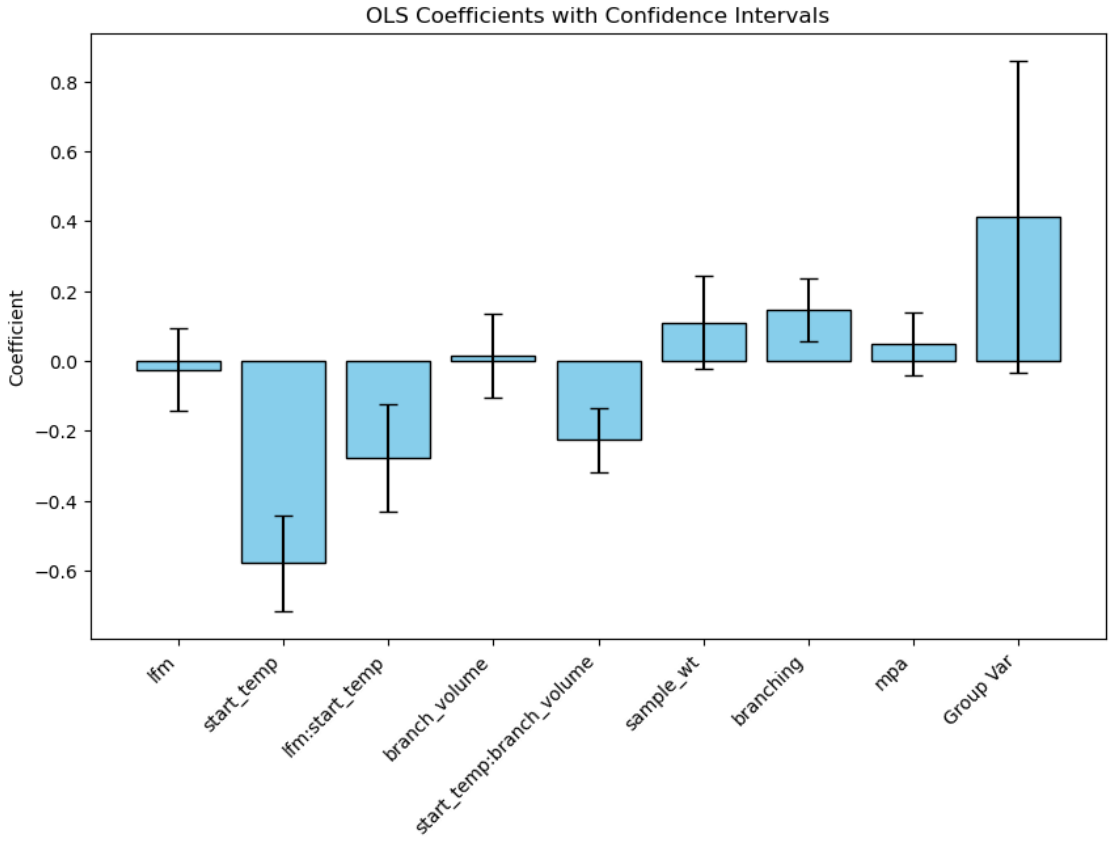
Mixed Linear Model Regression Results

==========

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1584
Min. group size:	1	Log-Likelihood:	-100.7240
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

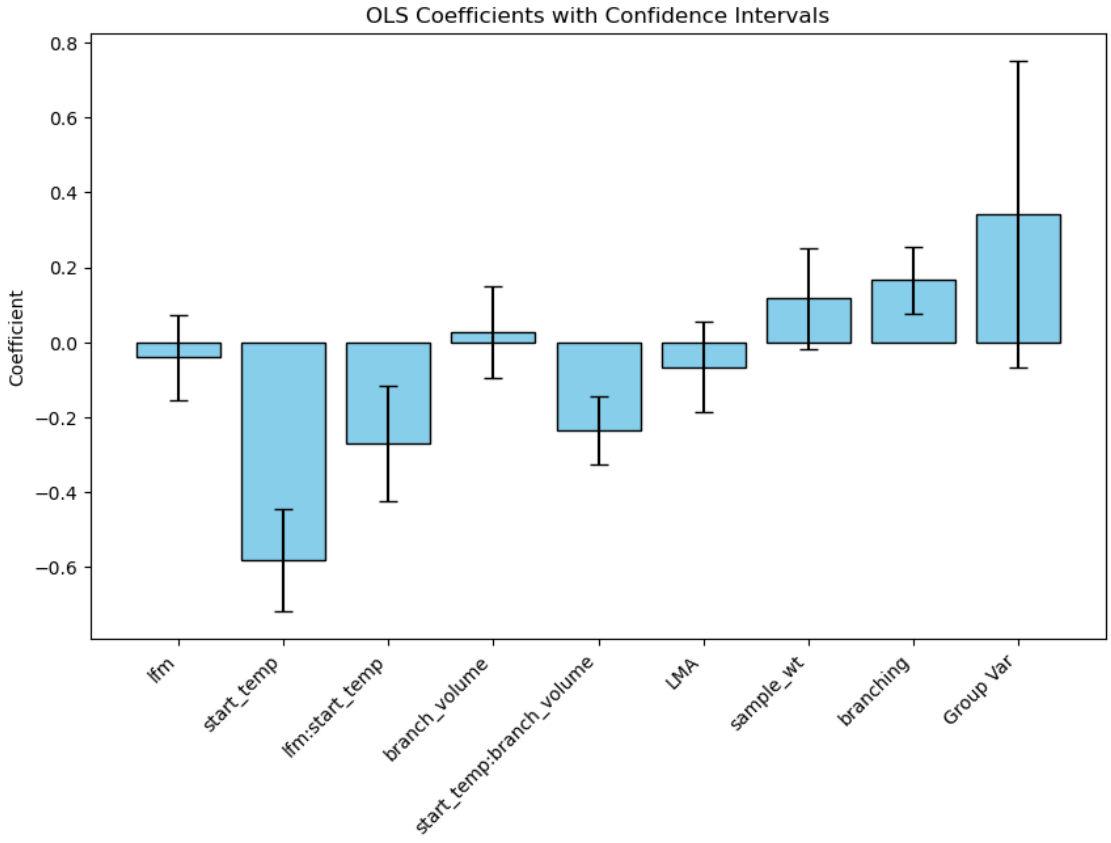
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.041	0.051	-0.796	0.426	-0.140	0.059
lfm	-0.025	0.060	-0.422	0.673	-0.143	0.092
start_temp	-0.578	0.070	-8.259	0.000	-0.715	-0.441
lfm:start_temp	-0.278	0.078	-3.546	0.000	-0.432	-0.124
branch_volume	0.016	0.062	0.263	0.792	-0.104	0.137
start_temp:branch_volume	-0.226	0.046	-4.918	0.000	-0.317	-0.136
sample_wt	0.111	0.067	1.643	0.100	-0.021	0.243

```
branching                 0.146    0.046  3.192 0.001  0.057  0.236
mpa                       0.049    0.046  1.084 0.278 -0.040  0.139
Group Var                 0.065    0.091
=============================================================================
```




```
            Mixed Linear Model Regression Results
=============================================================================
Model:                MixedLM    Dependent Variable:    temp_change
No. Observations:     162        Method:                ML
No. Groups:           54         Scale:                 0.1632
Min. group size:      1          Log-Likelihood:        -100.7488
Max. group size:      11         Converged:             Yes
Mean group size:      3.0
-----------------------------------------------------------------------------
                        Coef.  Std.Err.   z    P>|z| [0.025 0.975]
-----------------------------------------------------------------------------
Intercept               -0.045    0.049 -0.922 0.356 -0.142  0.051
lfm                     -0.041    0.058 -0.697 0.486 -0.155  0.074
start_temp              -0.580    0.070 -8.316 0.000 -0.717 -0.443
lfm:start_temp          -0.271    0.079 -3.441 0.001 -0.425 -0.116
```

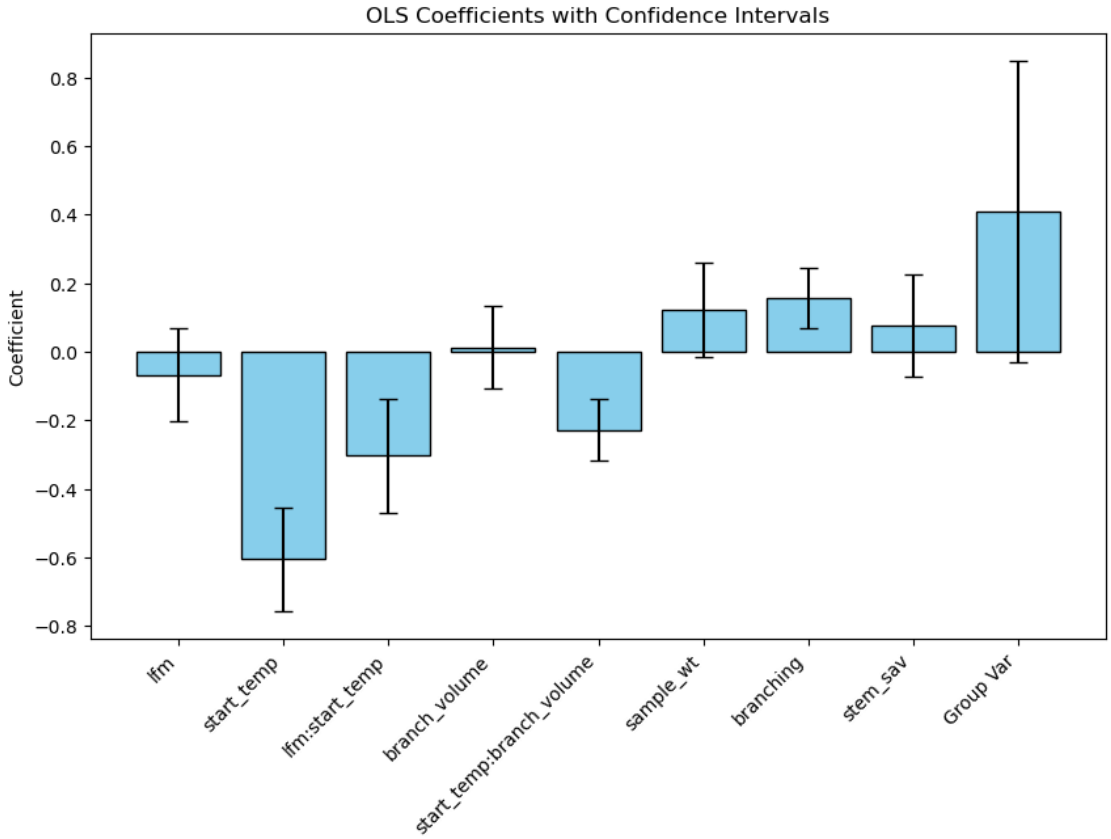
```
branch_volume              0.027    0.062  0.439 0.661 -0.094  0.148
start_temp:branch_volume  -0.235    0.046 -5.130 0.000 -0.324 -0.145
LMA                       -0.066    0.061 -1.078 0.281 -0.186  0.054
sample_wt                  0.117    0.069  1.698 0.089 -0.018  0.251
branching                  0.165    0.045  3.670 0.000  0.077  0.254
Group Var                  0.056    0.084
================================================================
```



Mixed Linear Model Regression Results

```
================================================================
Model:               MixedLM    Dependent Variable:    temp_change
No. Observations:    162        Method:                ML
No. Groups:          54         Scale:                 0.1588
Min. group size:     1          Log-Likelihood:        -100.8031
Max. group size:     11         Converged:             Yes
Mean group size:     3.0
----------------------------------------------------------------
                      Coef.  Std.Err.   z    P>|z| [0.025 0.975]
----------------------------------------------------------------
Intercept             -0.037    0.051 -0.715 0.475 -0.138  0.064
```

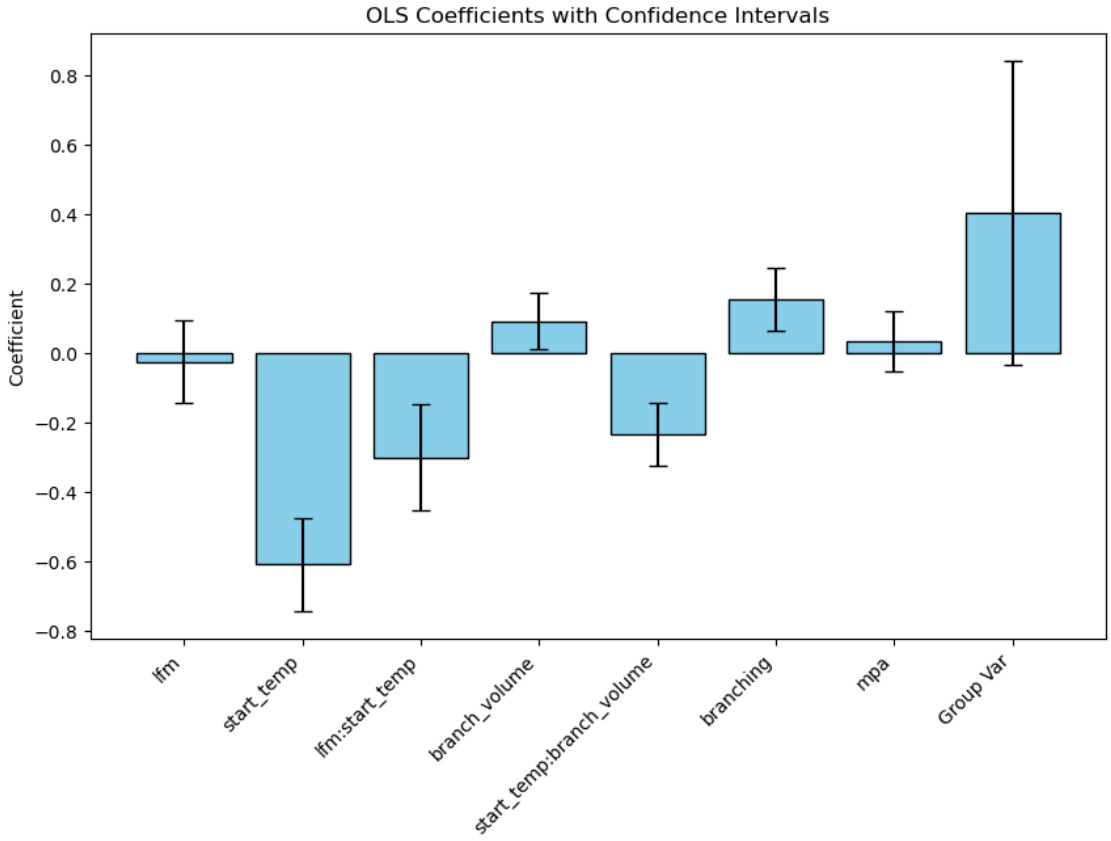
lfm	-0.067	0.069	-0.977	0.328	-0.202	0.068
start_temp	-0.606	0.077	-7.888	0.000	-0.756	-0.455
lfm:start_temp	-0.304	0.085	-3.563	0.000	-0.471	-0.137
branch_volume	0.013	0.062	0.207	0.836	-0.109	0.134
start_temp:branch_volume	-0.228	0.046	-4.991	0.000	-0.318	-0.139
sample_wt	0.122	0.071	1.721	0.085	-0.017	0.261
branching	0.155	0.045	3.471	0.001	0.068	0.243
stem_sav	0.076	0.075	1.002	0.316	-0.072	0.223
Group Var	0.065	0.089				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1616
Min. group size:	1	Log-Likelihood:	-102.0644
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.038	0.051	-0.740	0.459	-0.138	0.062
lfm	-0.026	0.060	-0.427	0.670	-0.144	0.092
start_temp	-0.609	0.068	-8.944	0.000	-0.742	-0.475
lfm:start_temp	-0.300	0.078	-3.853	0.000	-0.453	-0.147
branch_volume	0.091	0.042	2.199	0.028	0.010	0.173
start_temp:branch_volume	-0.234	0.046	-5.069	0.000	-0.324	-0.144
branching	0.154	0.046	3.338	0.001	0.063	0.244
mpa	0.034	0.045	0.759	0.448	-0.054	0.122
Group Var	0.065	0.090				

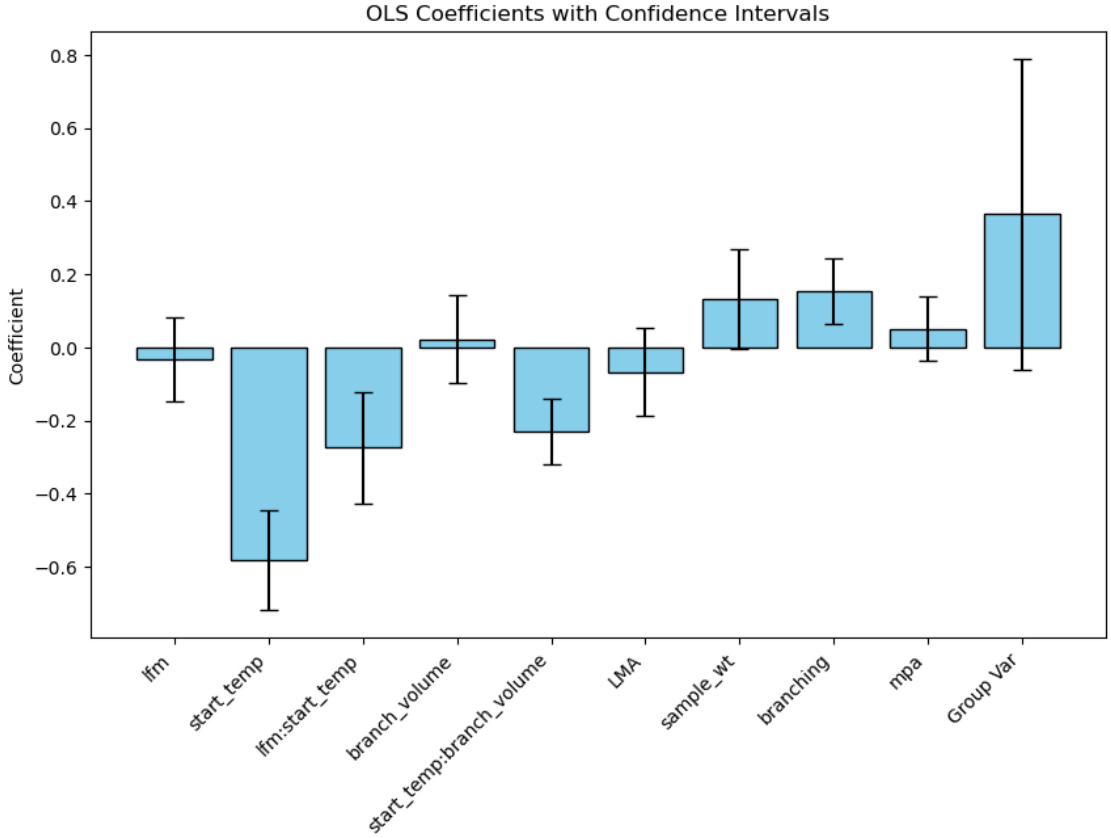


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1604
Min. group size:	1	Log-Likelihood:	-100.1254
Max. group size:	11	Converged:	Yes

Mean group size: 3.0

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.042	0.050	-0.836	0.403	-0.139	0.056
lfm	-0.034	0.059	-0.583	0.560	-0.150	0.081
start_temp	-0.582	0.069	-8.397	0.000	-0.718	-0.446
lfm:start_temp	-0.275	0.078	-3.541	0.000	-0.427	-0.123
branch_volume	0.022	0.062	0.361	0.718	-0.098	0.143
start_temp:branch_volume	-0.230	0.046	-4.996	0.000	-0.320	-0.140
LMA	-0.068	0.061	-1.109	0.268	-0.189	0.052
sample_wt	0.132	0.070	1.895	0.058	-0.005	0.269
branching	0.153	0.046	3.317	0.001	0.063	0.244
mpa	0.050	0.045	1.114	0.265	-0.038	0.138
Group Var	0.058	0.087				

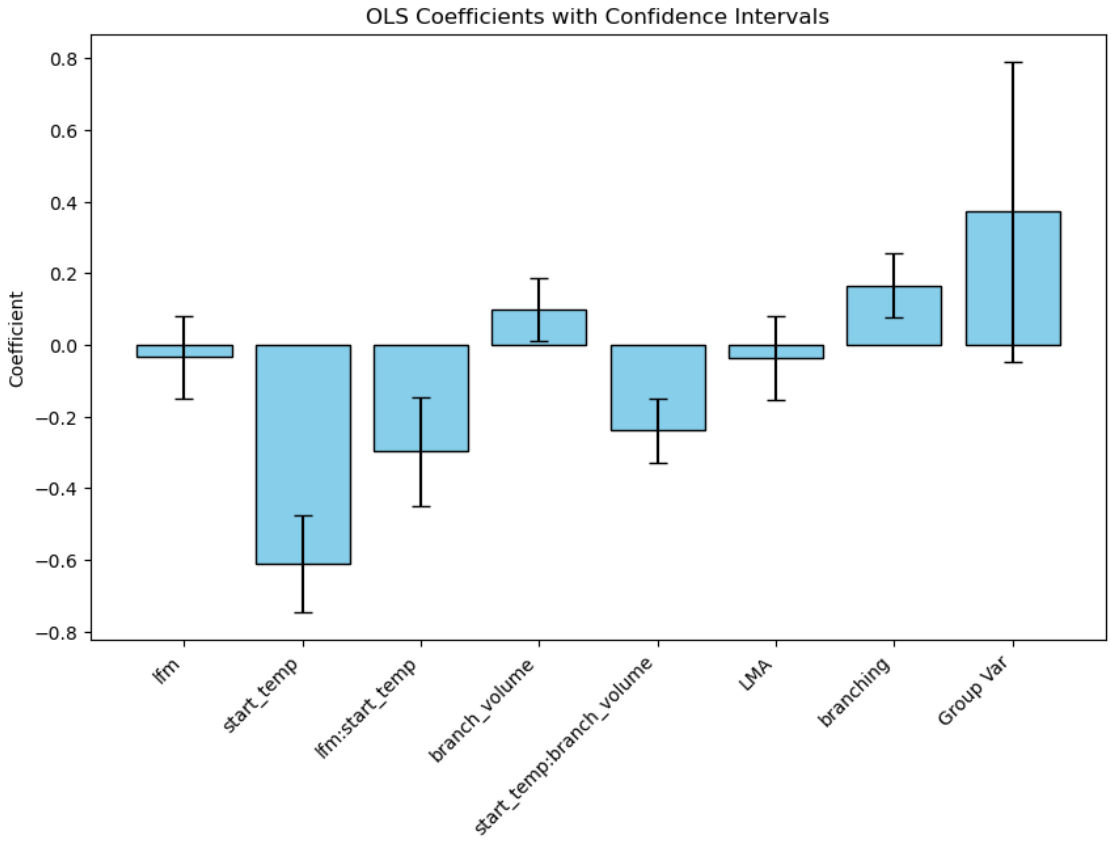


Mixed Linear Model Regression Results

Model: MixedLM Dependent Variable: temp_change

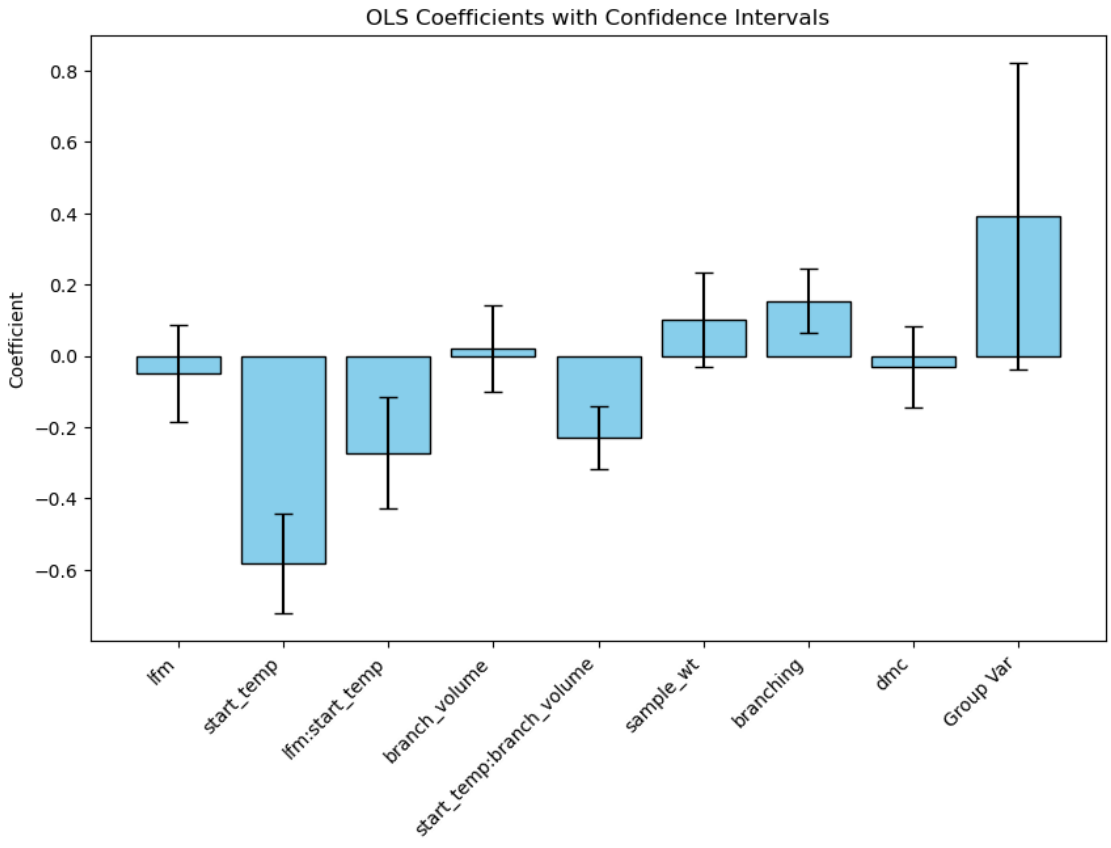
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1640
Min. group size:	1	Log-Likelihood:	-102.1764
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.041	0.050	-0.811	0.417	-0.140	0.058
lfm	-0.034	0.059	-0.577	0.564	-0.151	0.082
start_temp	-0.611	0.069	-8.906	0.000	-0.745	-0.476
lfm:start_temp	-0.297	0.078	-3.816	0.000	-0.450	-0.145
branch_volume	0.099	0.045	2.184	0.029	0.010	0.188
start_temp:branch_volume	-0.239	0.046	-5.187	0.000	-0.330	-0.149
LMA	-0.036	0.059	-0.598	0.550	-0.152	0.081
branching	0.166	0.045	3.646	0.000	0.077	0.255
Group Var	0.061	0.086				



Mixed Linear Model Regression Results

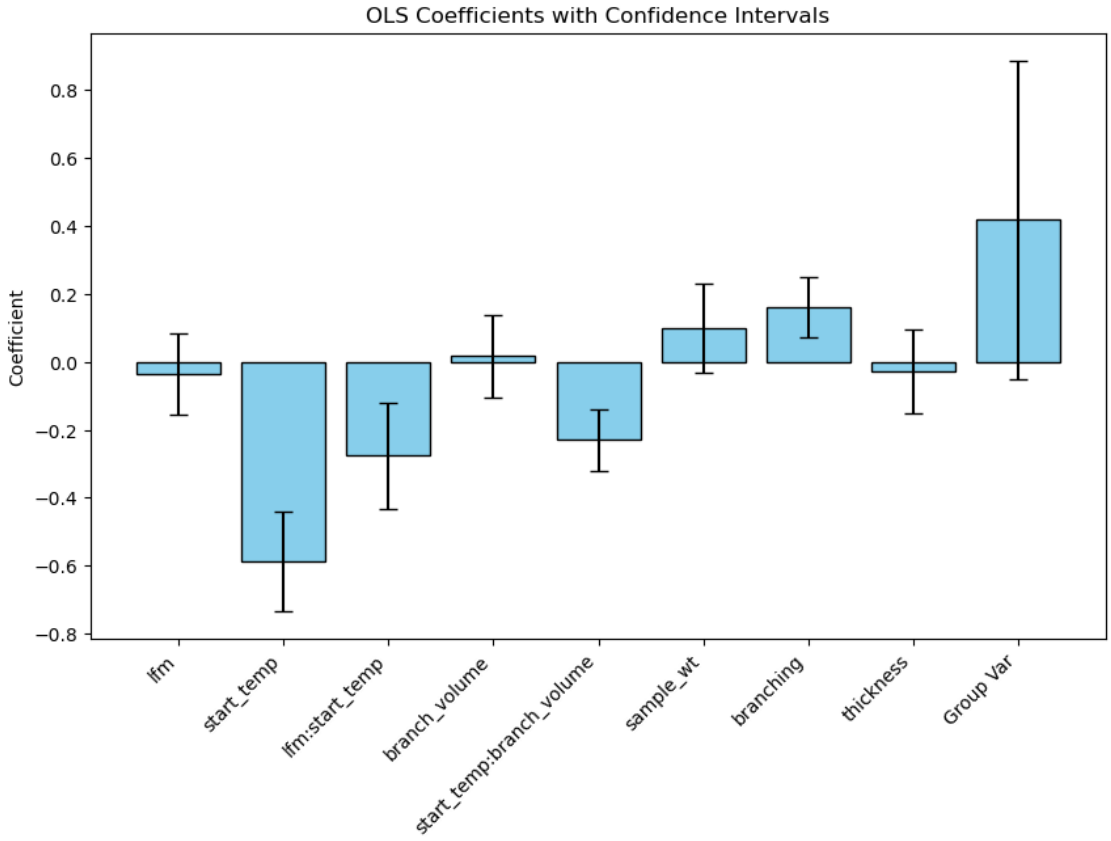
```
=================================================================
Model:                MixedLM    Dependent Variable:    temp_change
No. Observations:     162        Method:                ML
No. Groups:           54         Scale:                 0.1607
Min. group size:      1          Log-Likelihood:        -101.1851
Max. group size:      11         Converged:             Yes
Mean group size:      3.0
-----------------------------------------------------------------
                          Coef.  Std.Err.   z    P>|z| [0.025 0.975]
-----------------------------------------------------------------
Intercept                -0.044    0.050 -0.870 0.384 -0.143  0.055
lfm                      -0.050    0.069 -0.723 0.470 -0.184  0.085
start_temp               -0.582    0.071 -8.165 0.000 -0.722 -0.443
lfm:start_temp           -0.273    0.079 -3.442 0.001 -0.428 -0.117
branch_volume             0.019    0.062  0.305 0.760 -0.102  0.140
start_temp:branch_volume -0.230    0.046 -5.018 0.000 -0.320 -0.140
sample_wt                 0.102    0.067  1.518 0.129 -0.030  0.234
branching                 0.154    0.045  3.391 0.001  0.065  0.243
dmc                      -0.030    0.058 -0.510 0.610 -0.144  0.084
Group Var                 0.063    0.088
=================================================================
```



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1590
Min. group size:	1	Log-Likelihood:	-101.2046
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

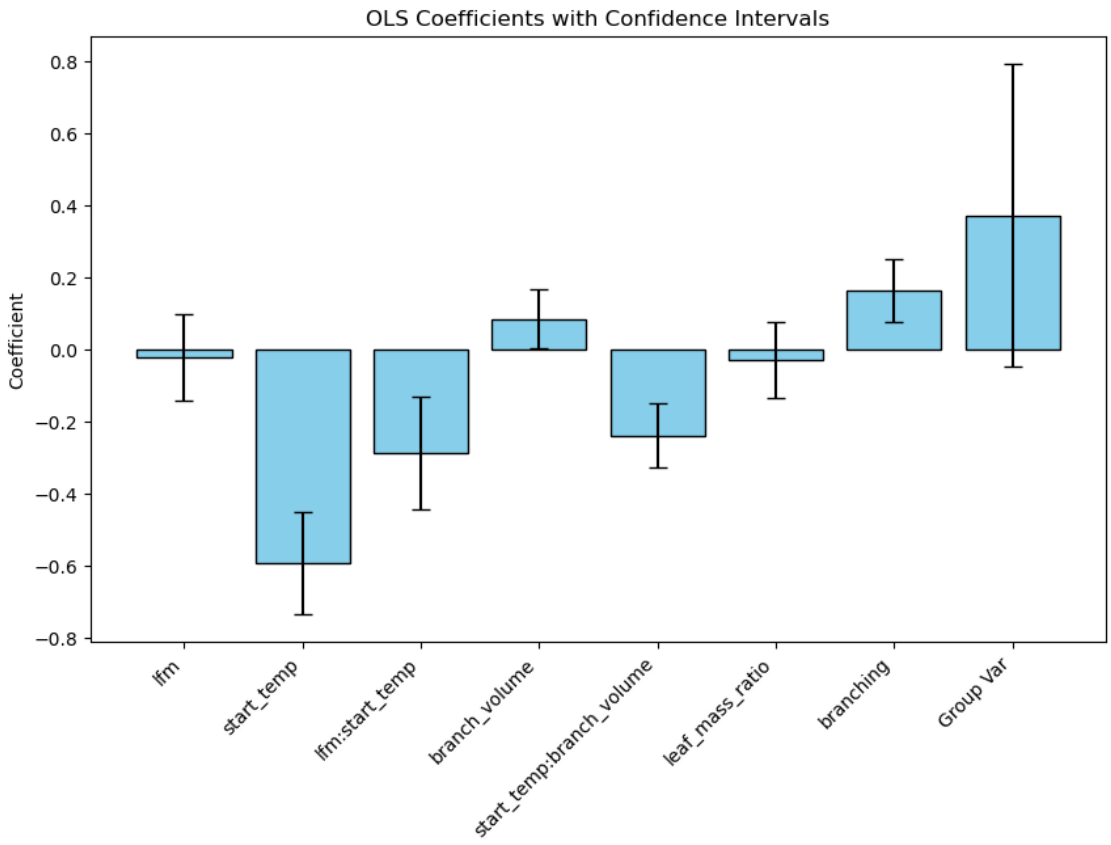
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.045	0.051	-0.885	0.376	-0.145	0.055
lfm	-0.035	0.060	-0.584	0.559	-0.153	0.083
start_temp	-0.587	0.074	-7.902	0.000	-0.733	-0.442
lfm:start_temp	-0.275	0.080	-3.456	0.001	-0.431	-0.119
branch_volume	0.017	0.062	0.267	0.789	-0.106	0.139
start_temp:branch_volume	-0.229	0.046	-4.989	0.000	-0.319	-0.139
sample_wt	0.100	0.067	1.497	0.134	-0.031	0.231
branching	0.162	0.045	3.569	0.000	0.073	0.251
thickness	-0.029	0.063	-0.467	0.641	-0.153	0.094
Group Var	0.066	0.095				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1641
Min. group size:	1	Log-Likelihood:	-102.2232
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.044	0.051	-0.863	0.388	-0.143	0.055
lfm	-0.022	0.062	-0.348	0.728	-0.143	0.100
start_temp	-0.592	0.073	-8.149	0.000	-0.734	-0.449
lfm:start_temp	-0.286	0.080	-3.577	0.000	-0.443	-0.129
branch_volume	0.084	0.042	2.006	0.045	0.002	0.166
start_temp:branch_volume	-0.238	0.046	-5.181	0.000	-0.328	-0.148
leaf_mass_ratio	-0.028	0.054	-0.513	0.608	-0.133	0.078
branching	0.164	0.045	3.632	0.000	0.075	0.252
Group Var	0.061	0.087				

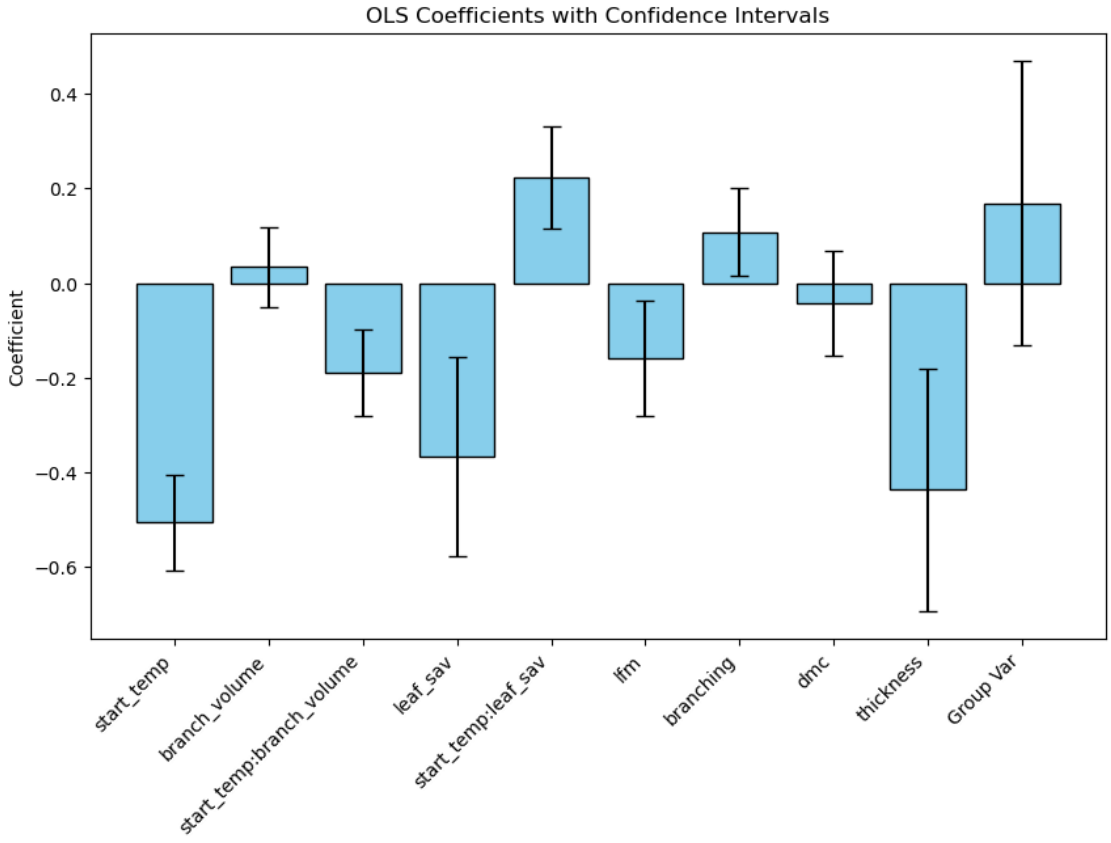


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1774
Min. group size:	1	Log-Likelihood:	-100.2390
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

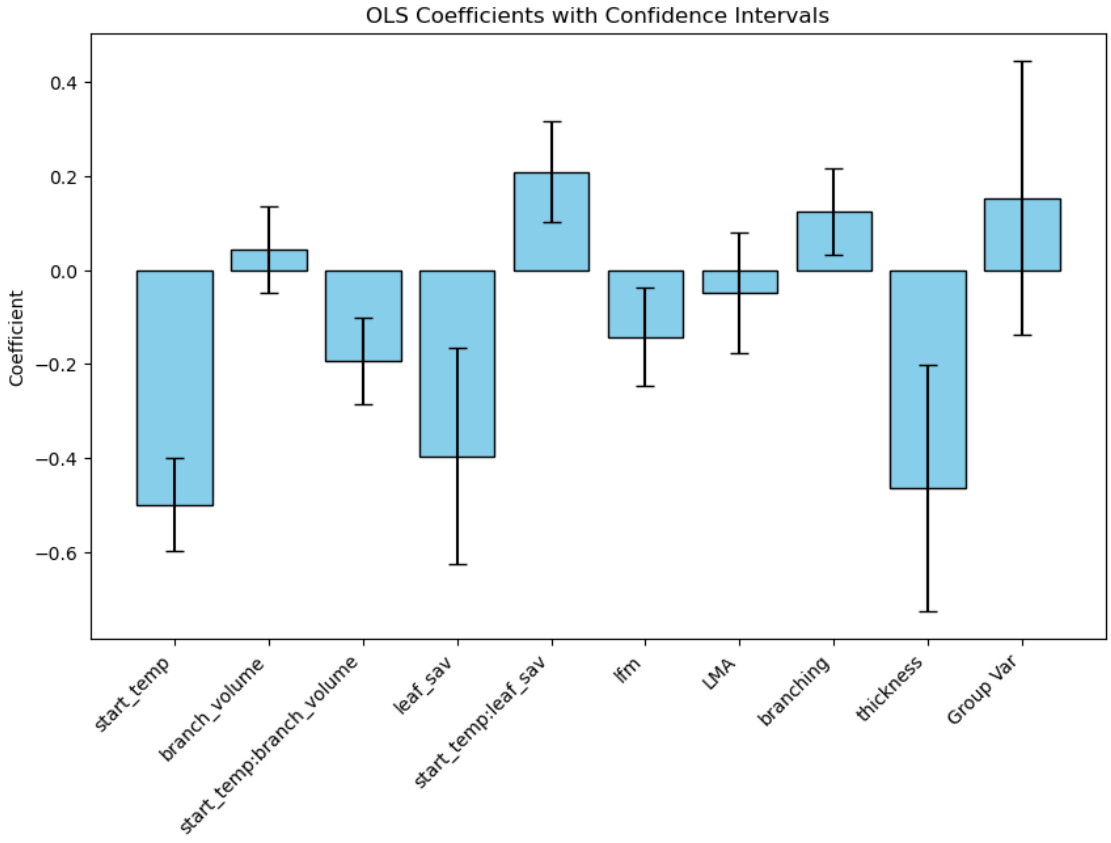
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.150	0.047	-3.165	0.002	-0.243	-0.057
start_temp	-0.505	0.052	-9.749	0.000	-0.607	-0.404
branch_volume	0.034	0.044	0.781	0.435	-0.051	0.119
start_temp:branch_volume	-0.189	0.047	-4.022	0.000	-0.281	-0.097
leaf_sav	-0.366	0.107	-3.422	0.001	-0.576	-0.157
start_temp:leaf_sav	0.223	0.055	4.068	0.000	0.115	0.330
lfm	-0.159	0.062	-2.572	0.010	-0.280	-0.038
branching	0.108	0.047	2.291	0.022	0.016	0.200

```
dmc                          -0.043    0.056 -0.755 0.450 -0.153  0.068
thickness                    -0.437    0.131 -3.346 0.001 -0.692 -0.181
Group Var                     0.030    0.065
================================================================
```



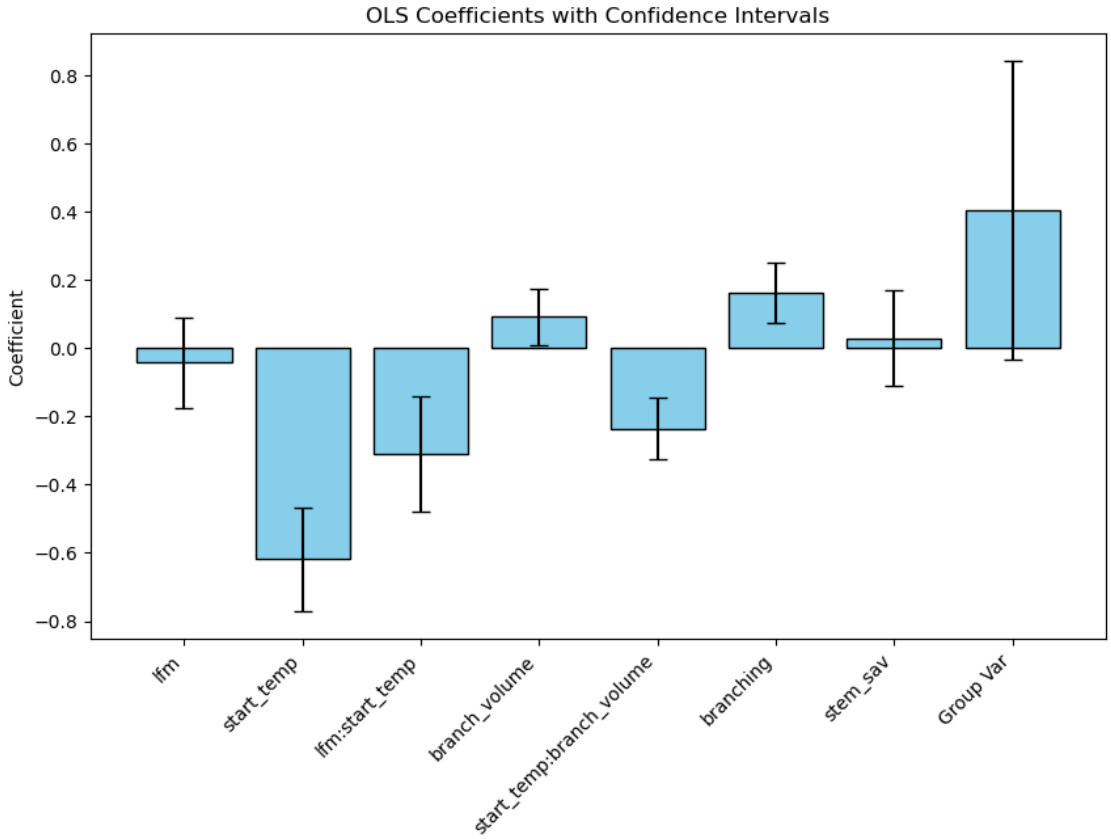

```
              Mixed Linear Model Regression Results
================================================================
Model:                MixedLM    Dependent Variable:    temp_change
No. Observations:     162        Method:                ML
No. Groups:           54         Scale:                 0.1792
Min. group size:      1          Log-Likelihood:        -100.2411
Max. group size:      11         Converged:             Yes
Mean group size:      3.0
----------------------------------------------------------------
                         Coef.  Std.Err.   z    P>|z| [0.025 0.975]
----------------------------------------------------------------
Intercept                -0.148    0.047 -3.150 0.002 -0.240 -0.056
start_temp               -0.499    0.051 -9.860 0.000 -0.598 -0.400
branch_volume             0.043    0.046  0.927 0.354 -0.048  0.134
start_temp:branch_volume -0.194    0.047 -4.110 0.000 -0.286 -0.101
```

```
leaf_sav                -0.396    0.117 -3.382 0.001 -0.626 -0.167
start_temp:leaf_sav      0.209    0.055  3.794 0.000  0.101  0.316
lfm                     -0.142    0.053 -2.677 0.007 -0.247 -0.038
LMA                     -0.050    0.065 -0.759 0.448 -0.178  0.079
branching                0.124    0.047  2.674 0.007  0.033  0.216
thickness               -0.462    0.134 -3.458 0.001 -0.724 -0.200
Group Var                0.027    0.063
================================================================
```




```
              Mixed Linear Model Regression Results
================================================================
Model:               MixedLM    Dependent Variable:    temp_change
No. Observations:    162        Method:                ML
No. Groups:          54         Scale:                 0.1621
Min. group size:     1          Log-Likelihood:        -102.2697
Max. group size:     11         Converged:             Yes
Mean group size:     3.0
----------------------------------------------------------------
                        Coef.  Std.Err.   z    P>|z| [0.025 0.975]
----------------------------------------------------------------
```

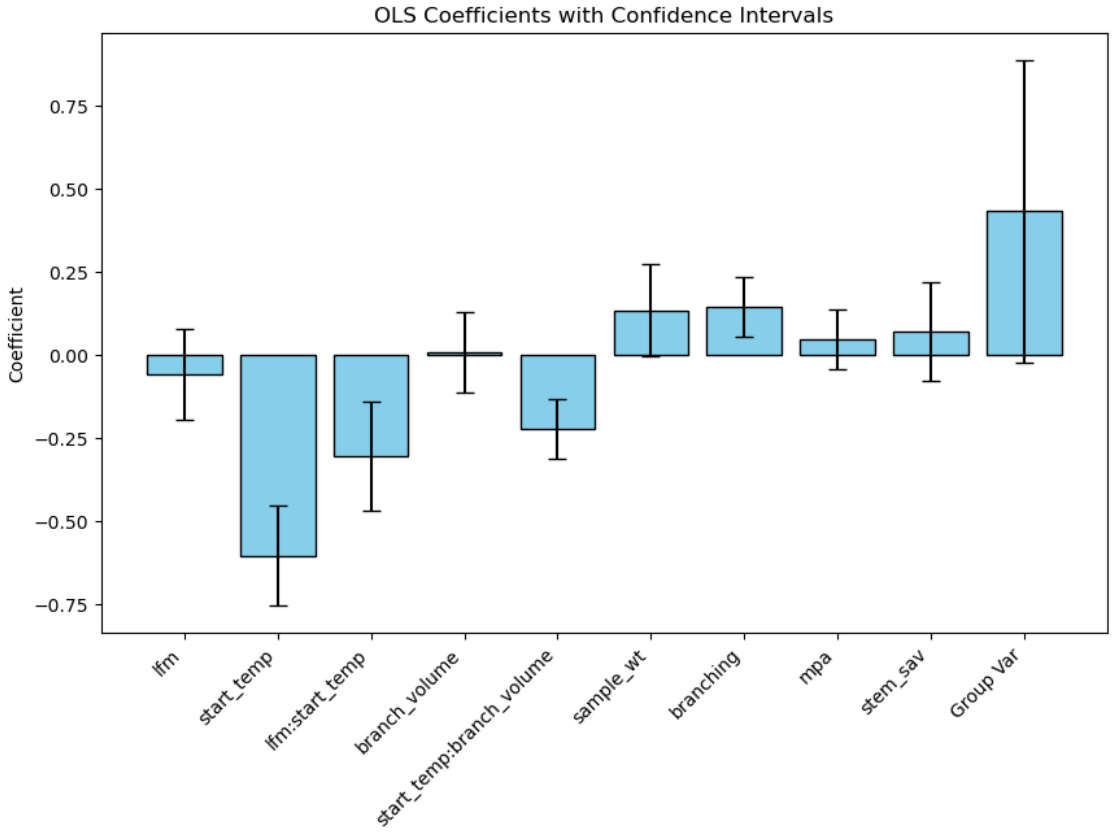
Intercept	-0.037	0.052	-0.722	0.470	-0.139	0.064
lfm	-0.043	0.068	-0.639	0.523	-0.176	0.089
start_temp	-0.619	0.077	-8.025	0.000	-0.771	-0.468
lfm:start_temp	-0.310	0.086	-3.593	0.000	-0.479	-0.141
branch_volume	0.091	0.042	2.162	0.031	0.009	0.174
start_temp:branch_volume	-0.236	0.046	-5.134	0.000	-0.326	-0.146
branching	0.161	0.045	3.572	0.000	0.073	0.249
stem_sav	0.029	0.071	0.407	0.684	-0.110	0.168
Group Var	0.065	0.090				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1563
Min. group size:	1	Log-Likelihood:	-100.2823
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

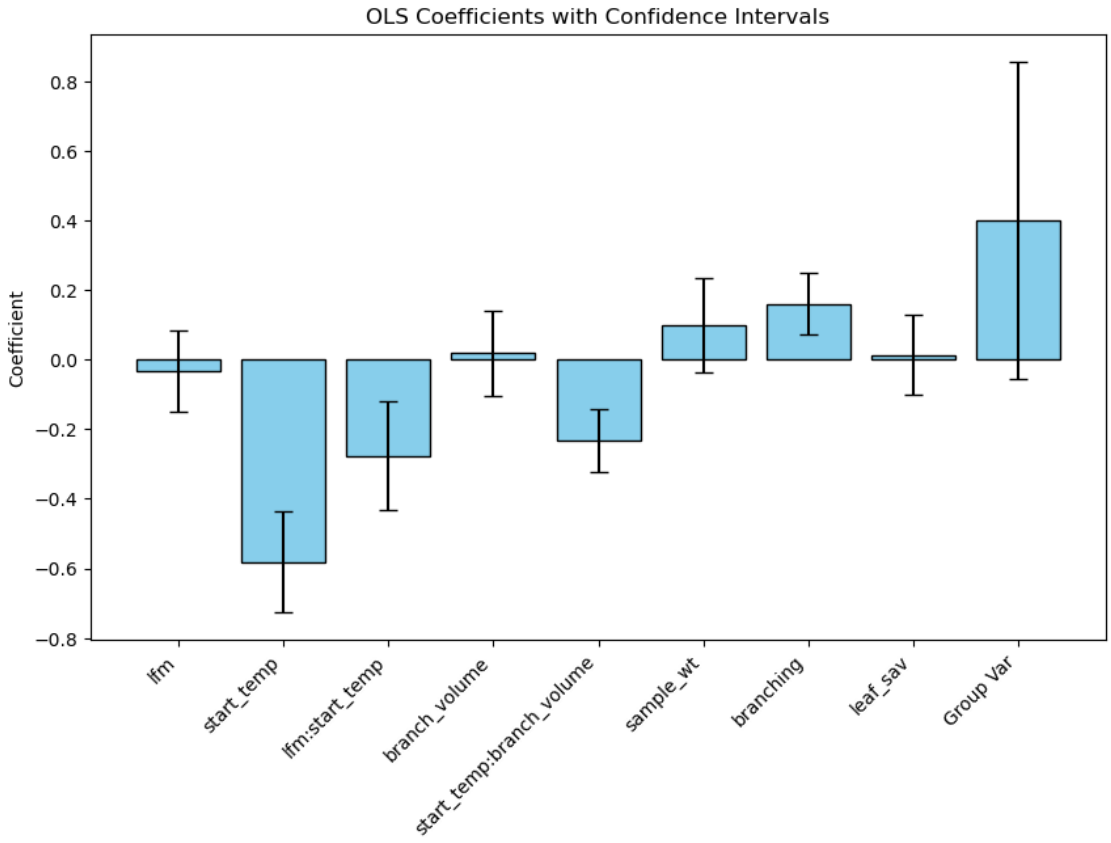
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.034	0.052	-0.646	0.518	-0.135	0.068
lfm	-0.059	0.069	-0.843	0.399	-0.195	0.078
start_temp	-0.605	0.076	-7.935	0.000	-0.754	-0.455
lfm:start_temp	-0.305	0.084	-3.633	0.000	-0.470	-0.141
branch_volume	0.009	0.062	0.141	0.888	-0.113	0.130
start_temp:branch_volume	-0.224	0.046	-4.868	0.000	-0.314	-0.134
sample_wt	0.134	0.072	1.872	0.061	-0.006	0.274
branching	0.144	0.046	3.149	0.002	0.054	0.234
mpa	0.046	0.046	1.018	0.309	-0.043	0.136
stem_sav	0.071	0.076	0.932	0.351	-0.078	0.219
Group Var	0.067	0.092				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1602

```
Min. group size:      1          Log-Likelihood:        -101.2871
Max. group size:      11         Converged:             Yes
Mean group size:      3.0
-----------------------------------------------------------------
                          Coef.  Std.Err.   z    P>|z| [0.025 0.975]
-----------------------------------------------------------------
Intercept                -0.044    0.051 -0.875 0.382 -0.144  0.055
lfm                      -0.031    0.060 -0.524 0.600 -0.149  0.086
start_temp               -0.581    0.074 -7.897 0.000 -0.726 -0.437
lfm:start_temp           -0.276    0.080 -3.445 0.001 -0.433 -0.119
branch_volume             0.019    0.062  0.312 0.755 -0.102  0.141
start_temp:branch_volume -0.231    0.046 -5.048 0.000 -0.321 -0.141
sample_wt                 0.100    0.069  1.453 0.146 -0.035  0.235
branching                 0.160    0.045  3.535 0.000  0.071  0.249
leaf_sav                  0.014    0.058  0.236 0.813 -0.100  0.128
Group Var                 0.064    0.093
=================================================================
```



7 Heat Flux Change

[10]:
```
AIC_iterator(flam, cols_use, Y_VAR='heat_flux_change',
             minnumsingle=mns, maxnumsingle=mxs, minnumint=mni, maxnumint=mxi)
```

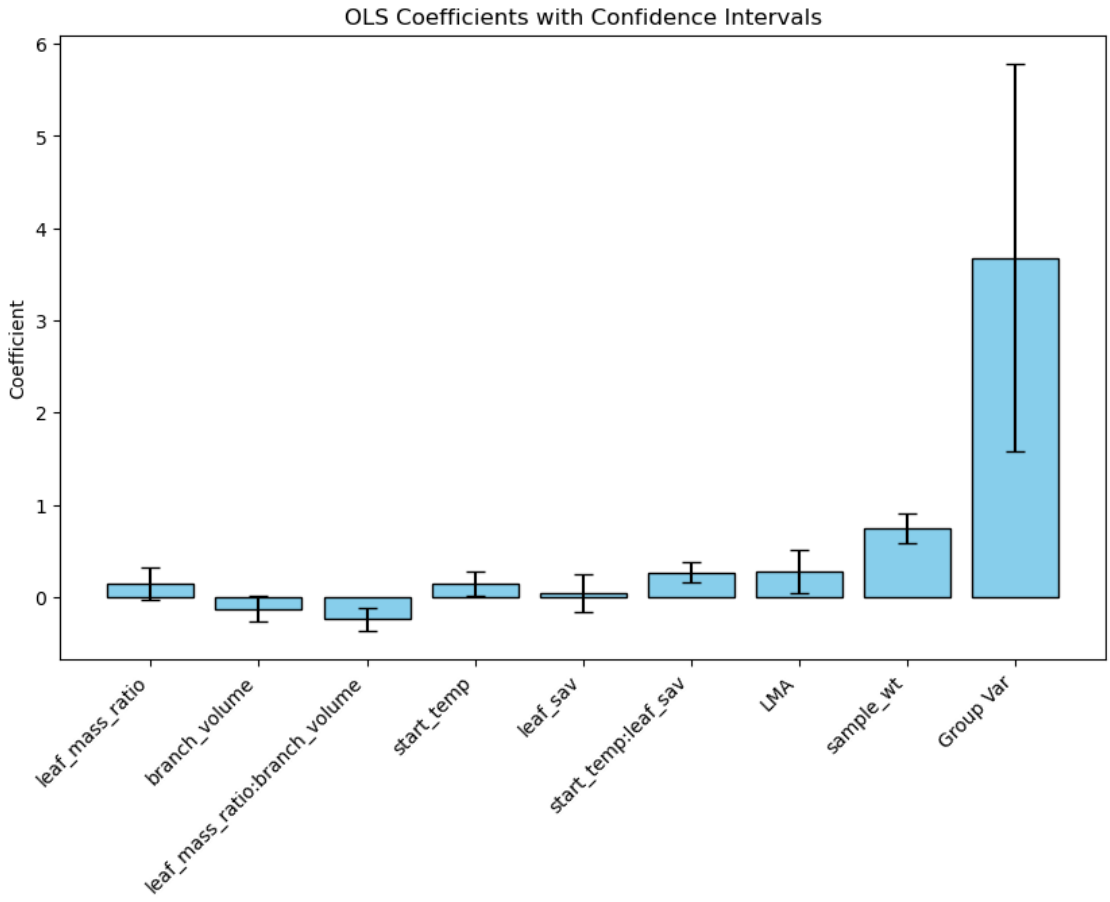
```
Columns present in sig. interaction terms: {'sample_wt', 'branch_volume',
'thickness', 'stem_sav', 'LMA', 'leaf_sav', 'lfm', 'start_temp', 'mpa',
'leaf_mass_ratio', 'dmc', 'species'}

Total Num. Cols : Num. Sig. Int. Cols;  13 : 12

Significant Interactions:
('lfm', 'start_temp')
('lfm', 'thickness')
('LMA', 'dmc')
('sample_wt', 'leaf_mass_ratio')
('sample_wt', 'start_temp')
('sample_wt', 'dmc')
('sample_wt', 'stem_sav')
('leaf_mass_ratio', 'mpa')
('leaf_mass_ratio', 'branch_volume')
('leaf_mass_ratio', 'thickness')
('mpa', 'start_temp')
('mpa', 'branch_volume')
('start_temp', 'branch_volume')
('start_temp', 'leaf_sav')
('start_temp', 'species')
('dmc', 'branch_volume')
('dmc', 'stem_sav')
('dmc', 'leaf_sav')
('dmc', 'thickness')
('branch_volume', 'stem_sav')

Number of formulas: 68070


heat_flux_change ~ leaf_mass_ratio*branch_volume + start_temp*leaf_sav + LMA +
sample_wt
heat_flux_change ~ leaf_mass_ratio*branch_volume + start_temp*leaf_sav + lfm +
LMA + sample_wt + thickness
heat_flux_change ~ leaf_mass_ratio*branch_volume + start_temp*leaf_sav + LMA +
sample_wt + thickness
heat_flux_change ~ leaf_mass_ratio*branch_volume + start_temp*leaf_sav + lfm +
LMA + sample_wt
heat_flux_change ~ leaf_mass_ratio*branch_volume + start_temp*leaf_sav + lfm +
sample_wt + thickness
```

```
heat_flux_change ~ leaf_mass_ratio*branch_volume + start_temp*leaf_sav + LMA +
sample_wt + dmc + thickness
heat_flux_change ~ sample_wt*stem_sav + start_temp*leaf_sav + thickness +
species
heat_flux_change ~ sample_wt*stem_sav + start_temp*leaf_sav + lfm +
leaf_mass_ratio + branch_volume + thickness
heat_flux_change ~ leaf_mass_ratio*branch_volume + start_temp*leaf_sav + LMA +
sample_wt + stem_sav
heat_flux_change ~ leaf_mass_ratio*branch_volume + start_temp*leaf_sav + LMA +
sample_wt + mpa
heat_flux_change ~ leaf_mass_ratio*branch_volume + start_temp*leaf_sav + LMA +
sample_wt + branching
heat_flux_change ~ leaf_mass_ratio*branch_volume + start_temp*leaf_sav + LMA +
sample_wt + dmc
```

Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	heat_flux_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1371
Min. group size:	1	Log-Likelihood:	-131.4256
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.211	0.107	-1.968	0.049	-0.422	-0.001
leaf_mass_ratio	0.146	0.092	1.591	0.112	-0.034	0.327
branch_volume	-0.128	0.070	-1.826	0.068	-0.265	0.009
leaf_mass_ratio:branch_volume	-0.242	0.062	-3.906	0.000	-0.364	-0.121
start_temp	0.141	0.067	2.113	0.035	0.010	0.271
leaf_sav	0.039	0.106	0.367	0.714	-0.169	0.247
start_temp:leaf_sav	0.264	0.057	4.647	0.000	0.153	0.376
LMA	0.279	0.117	2.376	0.018	0.049	0.508
sample_wt	0.745	0.079	9.445	0.000	0.591	0.900
Group Var	0.505	0.398				

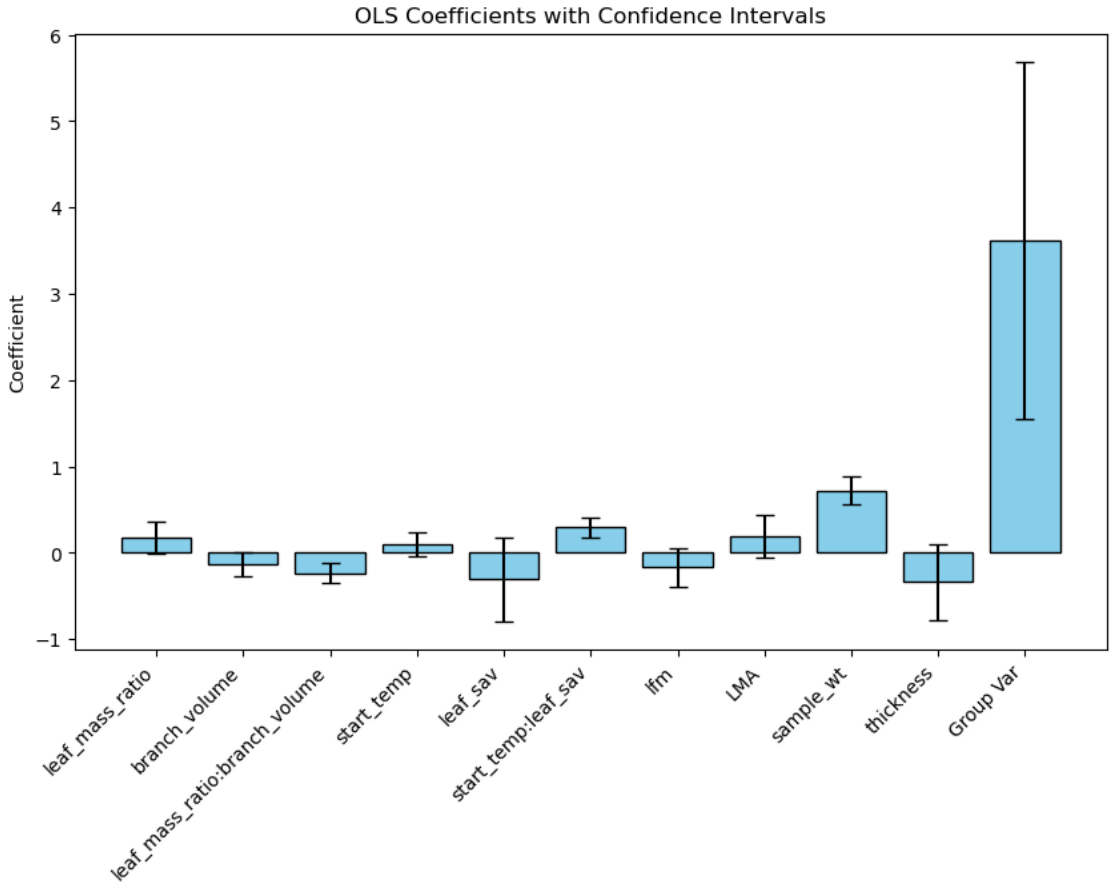


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	heat_flux_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1351
Min. group size:	1	Log-Likelihood:	-129.7979
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.233	0.108	-2.167	0.030	-0.445	-0.022
leaf_mass_ratio	0.174	0.092	1.889	0.059	-0.007	0.355
branch_volume	-0.135	0.070	-1.926	0.054	-0.273	0.002
leaf_mass_ratio:branch_volume	-0.235	0.062	-3.810	0.000	-0.355	-0.114
start_temp	0.094	0.071	1.323	0.186	-0.045	0.234
leaf_sav	-0.306	0.248	-1.234	0.217	-0.792	0.180
start_temp:leaf_sav	0.294	0.060	4.897	0.000	0.176	0.412
lfm	-0.168	0.115	-1.460	0.144	-0.393	0.058

LMA	0.194	0.124	1.560	0.119	-0.050	0.437
sample_wt	0.724	0.080	9.076	0.000	0.568	0.880
thickness	-0.339	0.222	-1.528	0.127	-0.775	0.096
Group Var	0.489	0.389				

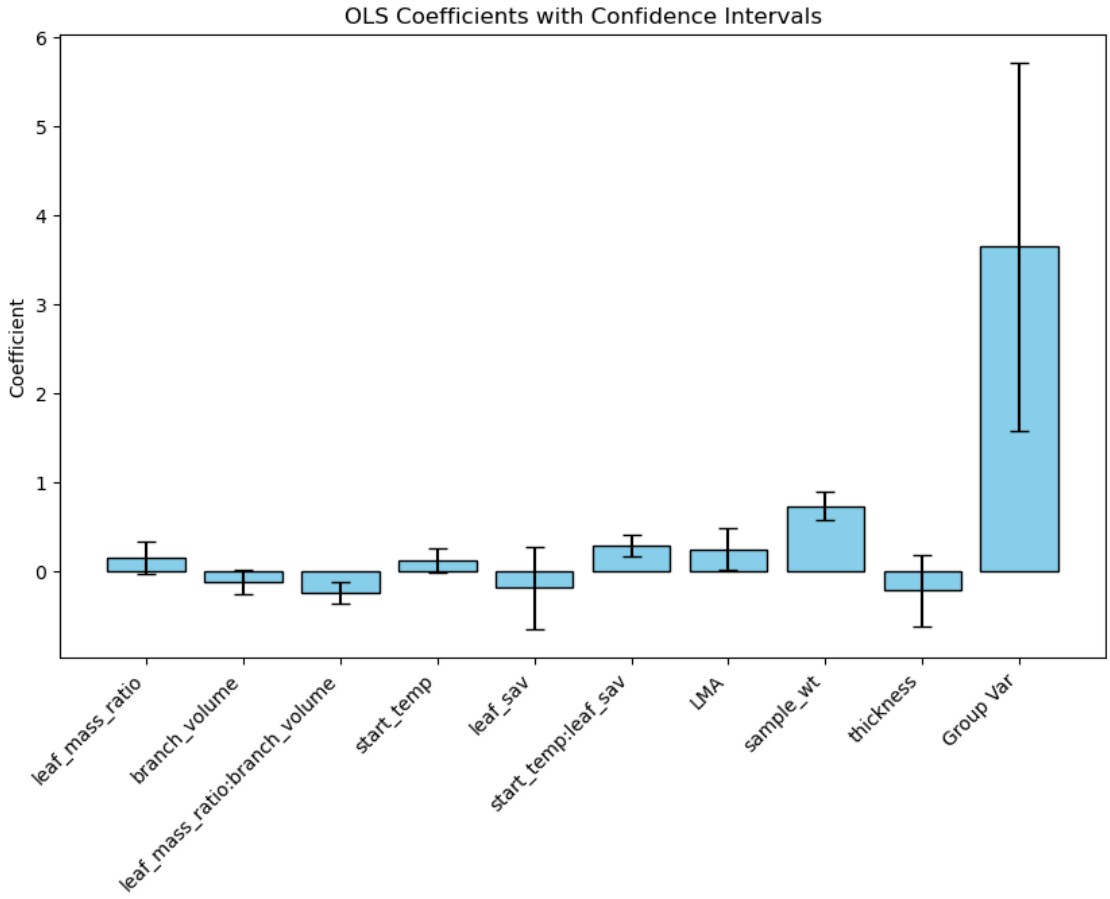


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	heat_flux_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1365
Min. group size:	1	Log-Likelihood:	-130.8632
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.233	0.109	-2.140	0.032	-0.446	-0.020
leaf_mass_ratio	0.150	0.092	1.633	0.103	-0.030	0.329

```
branch_volume                -0.121    0.070 -1.730 0.084 -0.258  0.016
leaf_mass_ratio:branch_volume -0.240    0.062 -3.873 0.000 -0.361 -0.118
start_temp                    0.116    0.070  1.644 0.100 -0.022  0.253
leaf_sav                     -0.187    0.236 -0.790 0.429 -0.650  0.276
start_temp:leaf_sav           0.286    0.060  4.766 0.000  0.169  0.404
LMA                           0.243    0.121  2.014 0.044  0.007  0.480
sample_wt                     0.729    0.080  9.087 0.000  0.572  0.886
thickness                    -0.222    0.208 -1.063 0.288 -0.630  0.187
Group Var                     0.498    0.390
================================================================================
```

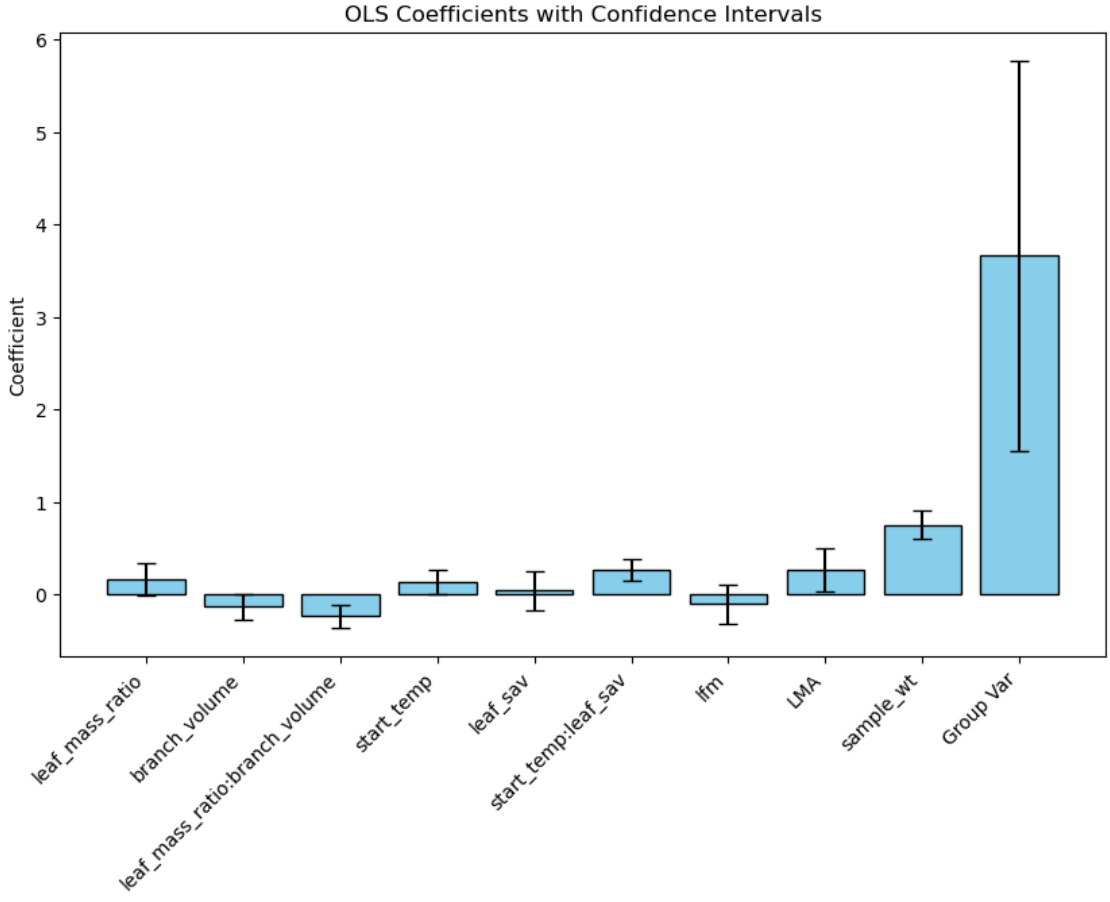


Mixed Linear Model Regression Results

```
================================================================================
Model:                MixedLM    Dependent Variable:    heat_flux_change
No. Observations:     162        Method:                ML
No. Groups:           54         Scale:                 0.1366
Min. group size:      1          Log-Likelihood:        -130.9577
Max. group size:      11         Converged:             Yes
```

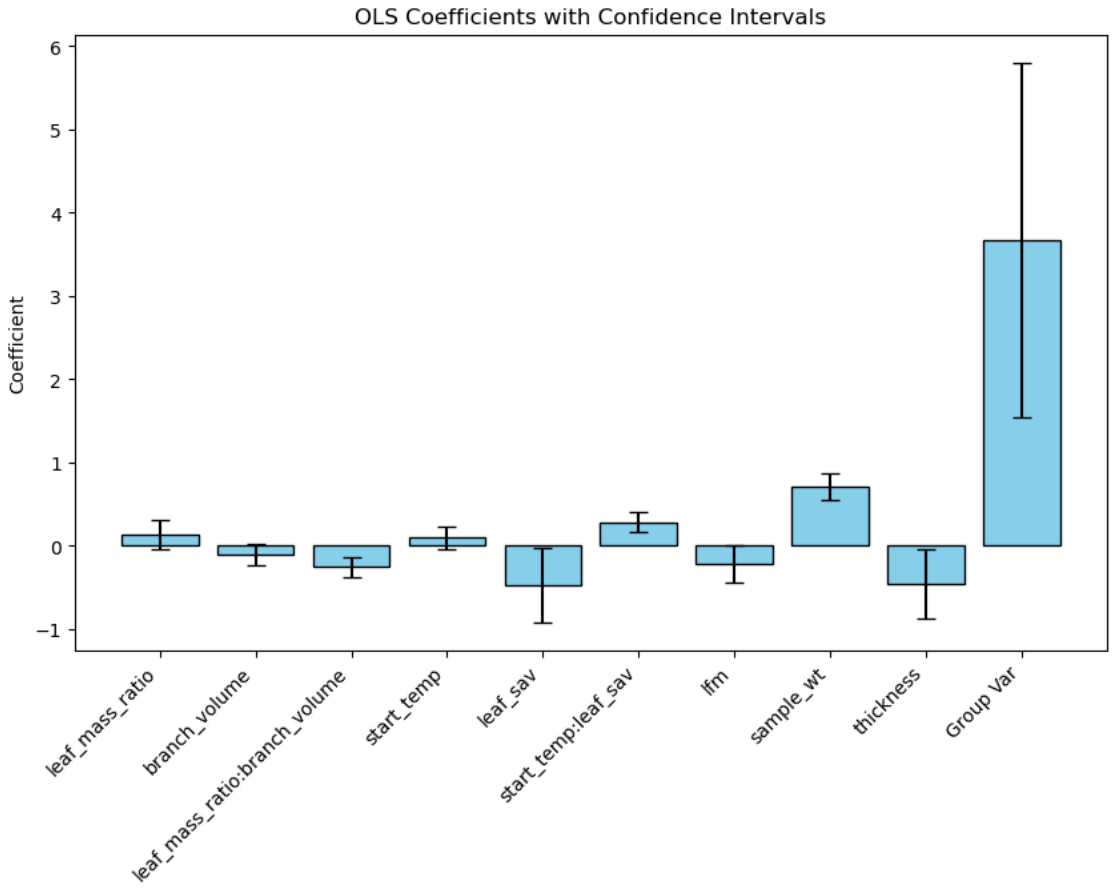
Mean group size: 3.0

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.205	0.107	-1.911	0.056	-0.415	0.005
leaf_mass_ratio	0.161	0.093	1.731	0.083	-0.021	0.342
branch_volume	-0.139	0.071	-1.963	0.050	-0.277	-0.000
leaf_mass_ratio:branch_volume	-0.240	0.062	-3.875	0.000	-0.361	-0.118
start_temp	0.136	0.067	2.041	0.041	0.005	0.266
leaf_sav	0.039	0.106	0.369	0.712	-0.169	0.248
start_temp:leaf_sav	0.262	0.057	4.591	0.000	0.150	0.374
lfm	-0.105	0.108	-0.968	0.333	-0.316	0.107
LMA	0.259	0.118	2.189	0.029	0.027	0.491
sample_wt	0.748	0.079	9.495	0.000	0.593	0.902
Group Var	0.500	0.399				



Mixed Linear Model Regression Results

```
=========================================================================
Model:                MixedLM    Dependent Variable:    heat_flux_change
No. Observations:     162        Method:                ML
No. Groups:           54         Scale:                 0.1365
Min. group size:      1          Log-Likelihood:        -131.0068
Max. group size:      11         Converged:             Yes
Mean group size:      3.0
-------------------------------------------------------------------------
                             Coef.  Std.Err.   z    P>|z| [0.025 0.975]
-------------------------------------------------------------------------
Intercept                    -0.240    0.109 -2.200 0.028 -0.453 -0.026
leaf_mass_ratio               0.140    0.090  1.557 0.120 -0.036  0.316
branch_volume                -0.107    0.068 -1.561 0.119 -0.241  0.027
leaf_mass_ratio:branch_volume -0.250   0.061 -4.075 0.000 -0.370 -0.129
start_temp                    0.095    0.072  1.322 0.186 -0.046  0.236
leaf_sav                     -0.475    0.226 -2.104 0.035 -0.917 -0.032
start_temp:leaf_sav           0.285    0.060  4.741 0.000  0.167  0.404
lfm                          -0.217    0.113 -1.930 0.054 -0.438  0.003
sample_wt                     0.715    0.080  8.934 0.000  0.558  0.872
thickness                    -0.459    0.211 -2.171 0.030 -0.873 -0.044
Group Var                     0.501    0.402
=========================================================================
```

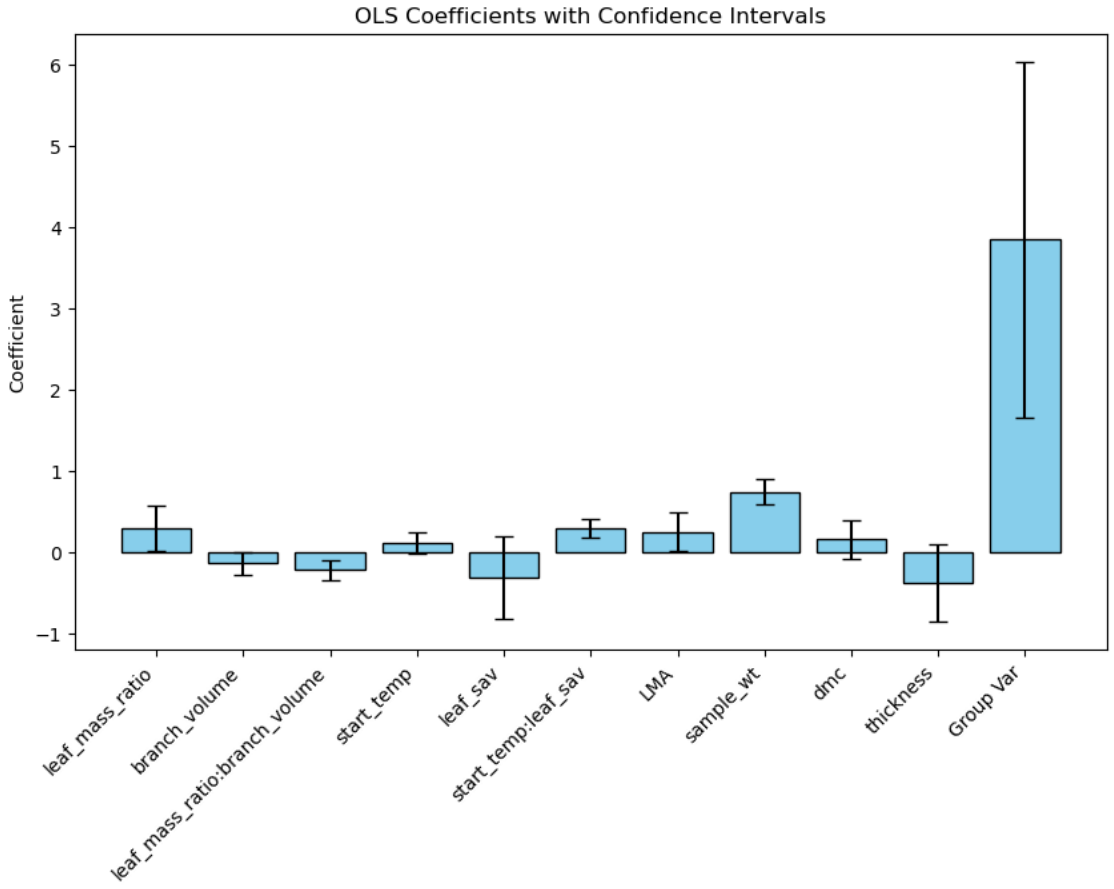


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	heat_flux_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1331
Min. group size:	1	Log-Likelihood:	-130.0637
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

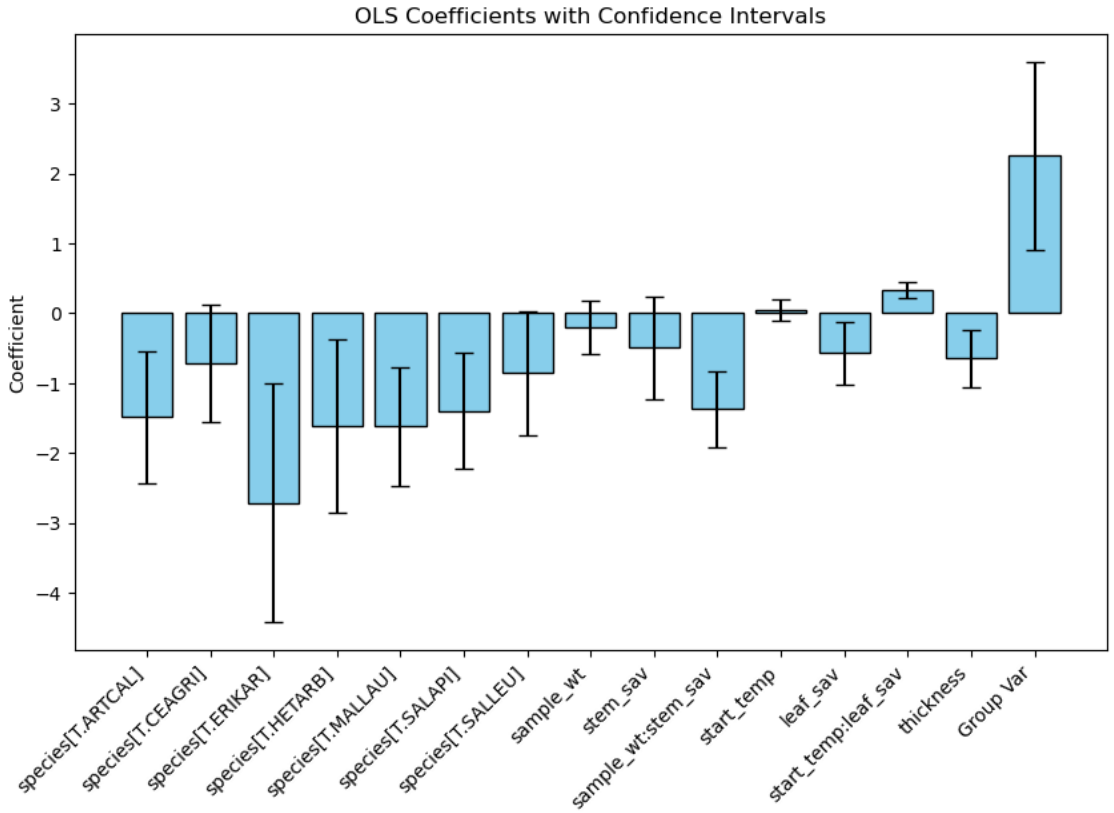
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.231	0.110	-2.106	0.035	-0.446	-0.016
leaf_mass_ratio	0.289	0.144	2.008	0.045	0.007	0.571
branch_volume	-0.143	0.071	-1.998	0.046	-0.283	-0.003
leaf_mass_ratio:branch_volume	-0.221	0.063	-3.500	0.000	-0.345	-0.097
start_temp	0.108	0.070	1.542	0.123	-0.029	0.245
leaf_sav	-0.316	0.259	-1.218	0.223	-0.824	0.192
start_temp:leaf_sav	0.295	0.060	4.927	0.000	0.178	0.412
LMA	0.244	0.121	2.018	0.044	0.007	0.481

```
sample_wt                      0.738    0.080  9.251 0.000  0.581  0.894
dmc                            0.155    0.122  1.265 0.206 -0.085  0.394
thickness                     -0.377    0.243 -1.551 0.121 -0.855  0.100
Group Var                      0.512    0.408
=================================================================================
```



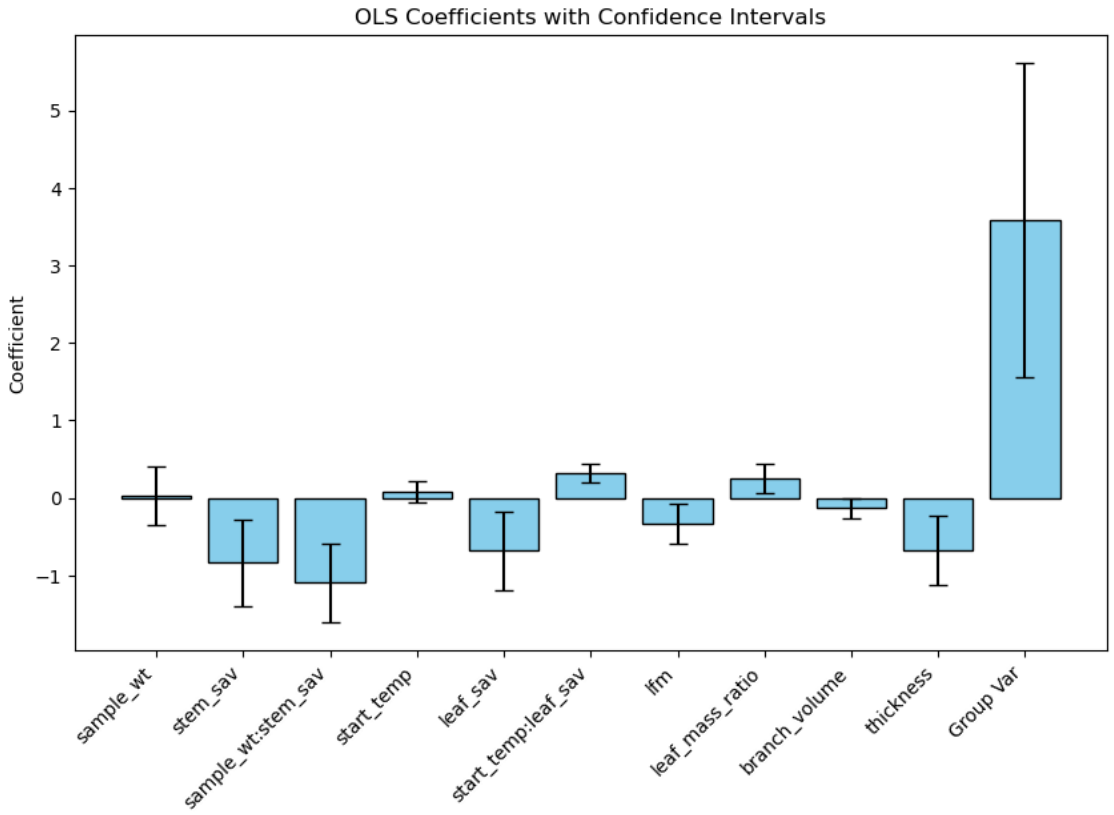

```
            Mixed Linear Model Regression Results
================================================================
Model:            MixedLM Dependent Variable: heat_flux_change
No. Observations: 162     Method:             ML
No. Groups:       54      Scale:              0.1479
Min. group size:  1       Log-Likelihood:     -126.1815
Max. group size:  11      Converged:          Yes
Mean group size:  3.0
----------------------------------------------------------------
                    Coef.  Std.Err.   z    P>|z| [0.025 0.975]
----------------------------------------------------------------
Intercept            0.541    0.375  1.440 0.150 -0.195  1.276
species[T.ARTCAL]   -1.488    0.482 -3.087 0.002 -2.433 -0.543
```

```
species[T.CEAGRI]   -0.711    0.427 -1.665 0.096 -1.548  0.126
species[T.ERIKAR]   -2.714    0.870 -3.122 0.002 -4.419 -1.010
species[T.HETARB]   -1.609    0.633 -2.543 0.011 -2.849 -0.369
species[T.MALLAU]   -1.623    0.437 -3.715 0.000 -2.479 -0.767
species[T.SALAPI]   -1.395    0.424 -3.288 0.001 -2.226 -0.563
species[T.SALLEU]   -0.854    0.453 -1.886 0.059 -1.742  0.033
sample_wt           -0.201    0.195 -1.027 0.305 -0.583  0.182
stem_sav            -0.496    0.376 -1.320 0.187 -1.233  0.241
sample_wt:stem_sav  -1.372    0.280 -4.897 0.000 -1.922 -0.823
start_temp           0.048    0.075  0.638 0.523 -0.100  0.196
leaf_sav            -0.569    0.230 -2.472 0.013 -1.021 -0.118
start_temp:leaf_sav  0.335    0.061  5.449 0.000  0.215  0.456
thickness           -0.649    0.209 -3.110 0.002 -1.057 -0.240
Group Var            0.333    0.264
============================================================
```



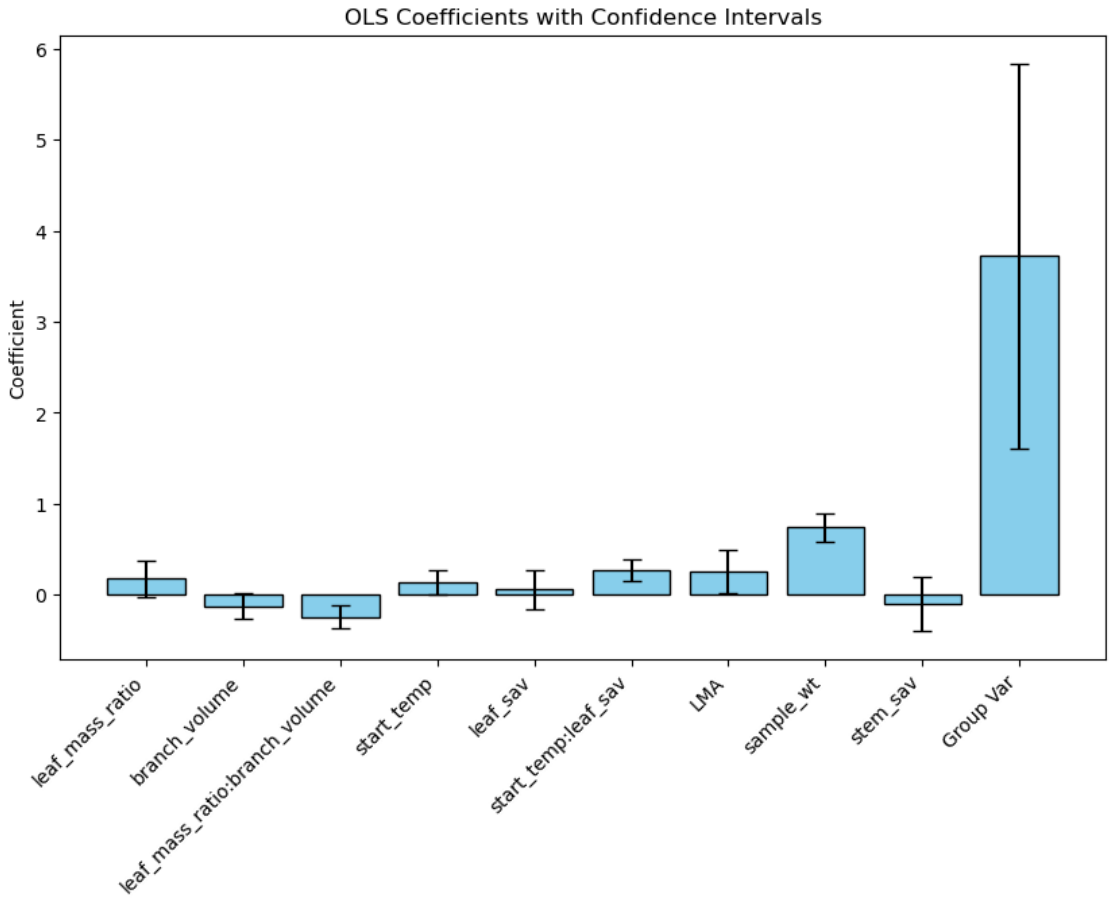

```
            Mixed Linear Model Regression Results
============================================================
Model:            MixedLM Dependent Variable: heat_flux_change
No. Observations: 162     Method:             ML
No. Groups:       54      Scale:              0.1361
```

```
Min. group size:  1       Log-Likelihood:     -130.1837
Max. group size:  11      Converged:          Yes
Mean group size:  3.0
------------------------------------------------------------
                    Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept           -0.780    0.184 -4.235 0.000 -1.142 -0.419
sample_wt            0.021    0.191  0.112 0.911 -0.353  0.396
stem_sav            -0.841    0.285 -2.950 0.003 -1.399 -0.282
sample_wt:stem_sav  -1.099    0.259 -4.237 0.000 -1.607 -0.590
start_temp           0.078    0.072  1.077 0.281 -0.064  0.219
leaf_sav            -0.686    0.259 -2.652 0.008 -1.192 -0.179
start_temp:leaf_sav  0.322    0.060  5.368 0.000  0.205  0.440
lfm                 -0.333    0.130 -2.563 0.010 -0.587 -0.078
leaf_mass_ratio      0.249    0.098  2.544 0.011  0.057  0.441
branch_volume       -0.136    0.068 -2.018 0.044 -0.269 -0.004
thickness           -0.677    0.230 -2.947 0.003 -1.128 -0.227
Group Var            0.487    0.382
============================================================
```



Mixed Linear Model Regression Results

```
=========================================================================
Model:                MixedLM    Dependent Variable:    heat_flux_change
No. Observations:     162        Method:                ML
No. Groups:           54         Scale:                 0.1363
Min. group size:      1          Log-Likelihood:        -131.2180
Max. group size:      11         Converged:             Yes
Mean group size:      3.0
-------------------------------------------------------------------------
                             Coef.  Std.Err.   z    P>|z| [0.025 0.975]
-------------------------------------------------------------------------
Intercept                   -0.221    0.109 -2.033 0.042 -0.434 -0.008
leaf_mass_ratio              0.172    0.100  1.722 0.085 -0.024  0.368
branch_volume               -0.127    0.070 -1.827 0.068 -0.264  0.009
leaf_mass_ratio:branch_volume -0.245  0.062 -3.951 0.000 -0.366 -0.123
start_temp                   0.138    0.067  2.066 0.039  0.007  0.268
leaf_sav                     0.058    0.110  0.524 0.600 -0.158  0.274
start_temp:leaf_sav          0.268    0.057  4.702 0.000  0.157  0.380
LMA                          0.258    0.122  2.121 0.034  0.020  0.496
sample_wt                    0.741    0.079  9.393 0.000  0.587  0.896
stem_sav                    -0.098    0.152 -0.643 0.520 -0.395  0.200
Group Var                    0.507    0.399
=========================================================================
```

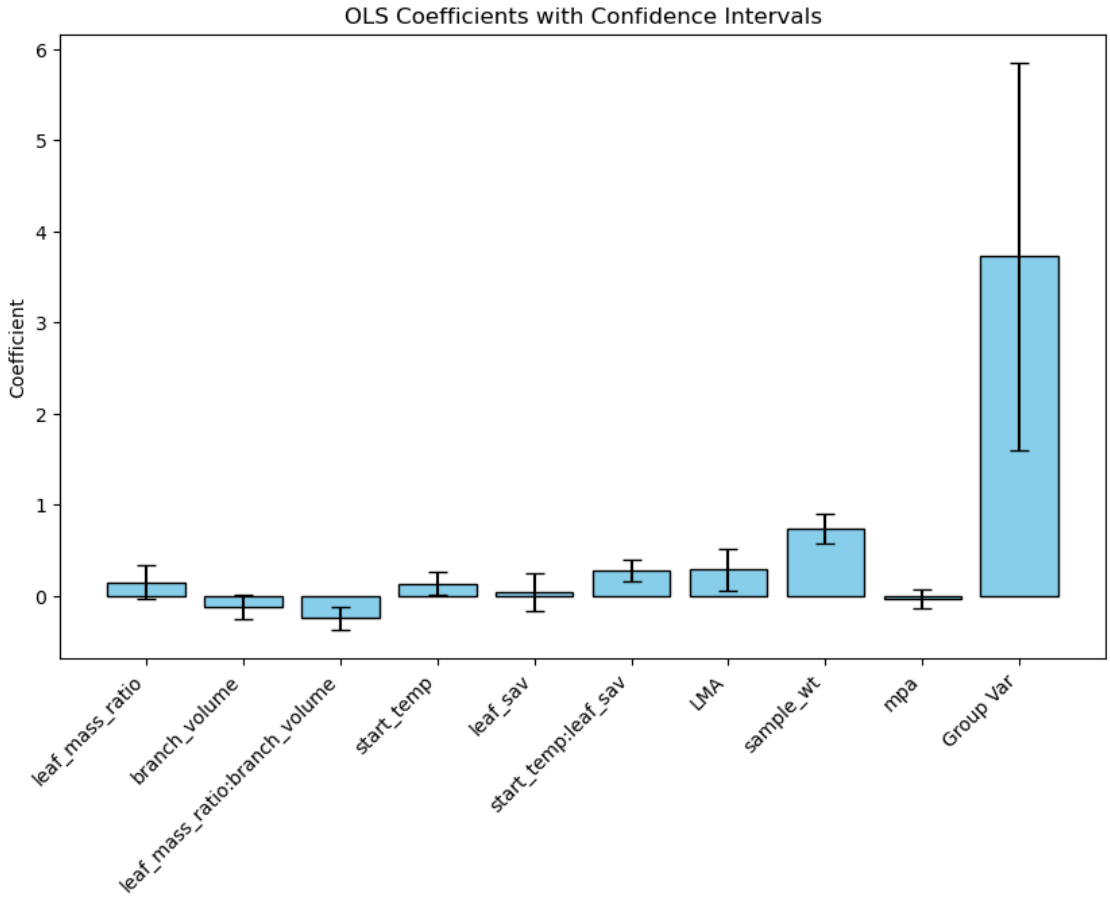


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	heat_flux_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1363
Min. group size:	1	Log-Likelihood:	-131.2225
Max. group size:	11	Converged:	Yes
Mean group size:	3.0		

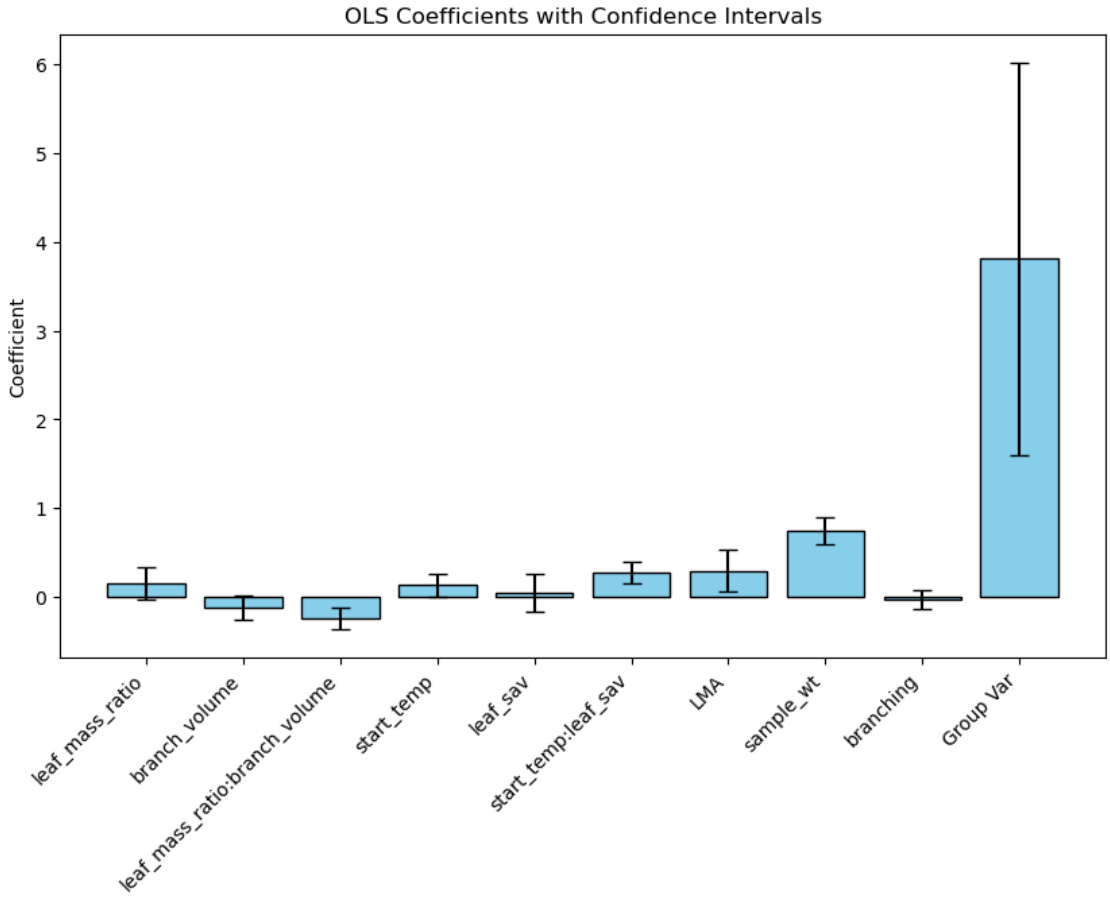
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.221	0.109	-2.034	0.042	-0.434	-0.008
leaf_mass_ratio	0.148	0.092	1.609	0.108	-0.032	0.328
branch_volume	-0.123	0.070	-1.758	0.079	-0.261	0.014
leaf_mass_ratio:branch_volume	-0.249	0.063	-3.964	0.000	-0.372	-0.126
start_temp	0.134	0.067	1.984	0.047	0.002	0.266
leaf_sav	0.044	0.107	0.414	0.679	-0.165	0.253
start_temp:leaf_sav	0.274	0.059	4.670	0.000	0.159	0.388
LMA	0.286	0.118	2.425	0.015	0.055	0.516

```
sample_wt                      0.733    0.081  9.063 0.000  0.575  0.892
mpa                           -0.036    0.056 -0.638 0.523 -0.145  0.074
Group Var                      0.508    0.401
=============================================================================
```




```
                Mixed Linear Model Regression Results
=============================================================================
Model:                MixedLM    Dependent Variable:    heat_flux_change
No. Observations:     162        Method:                ML
No. Groups:           54         Scale:                 0.1354
Min. group size:      1          Log-Likelihood:        -131.2575
Max. group size:      11         Converged:             Yes
Mean group size:      3.0
-----------------------------------------------------------------------------
                           Coef.  Std.Err.   z    P>|z| [0.025 0.975]
-----------------------------------------------------------------------------
Intercept                 -0.217    0.109 -1.996 0.046 -0.430 -0.004
leaf_mass_ratio            0.158    0.094  1.675 0.094 -0.027  0.343
```

branch_volume	-0.127	0.070	-1.830	0.067	-0.264	0.009
leaf_mass_ratio:branch_volume	-0.236	0.063	-3.778	0.000	-0.359	-0.114
start_temp	0.134	0.068	1.975	0.048	0.001	0.266
leaf_sav	0.043	0.107	0.403	0.687	-0.166	0.253
start_temp:leaf_sav	0.278	0.061	4.531	0.000	0.158	0.398
LMA	0.295	0.121	2.434	0.015	0.057	0.533
sample_wt	0.748	0.079	9.502	0.000	0.594	0.903
branching	-0.031	0.054	-0.581	0.561	-0.137	0.074
Group Var	0.516	0.416				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	heat_flux_change
No. Observations:	162	Method:	ML
No. Groups:	54	Scale:	0.1361
Min. group size:	1	Log-Likelihood:	-131.2720
Max. group size:	11	Converged:	Yes

Mean group size: 3.0

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	-0.205	0.108	-1.890	0.059	-0.417	0.008
leaf_mass_ratio	0.198	0.132	1.507	0.132	-0.060	0.457
branch_volume	-0.138	0.072	-1.911	0.056	-0.279	0.004
leaf_mass_ratio:branch_volume	-0.236	0.063	-3.740	0.000	-0.359	-0.112
start_temp	0.144	0.067	2.158	0.031	0.013	0.275
leaf_sav	0.051	0.109	0.467	0.641	-0.162	0.264
start_temp:leaf_sav	0.262	0.057	4.597	0.000	0.150	0.374
LMA	0.288	0.119	2.428	0.015	0.056	0.521
sample_wt	0.753	0.080	9.422	0.000	0.596	0.910
dmc	0.059	0.106	0.554	0.579	-0.149	0.266
Group Var	0.510	0.407