reg_AIC_multInteraction

May 1, 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	

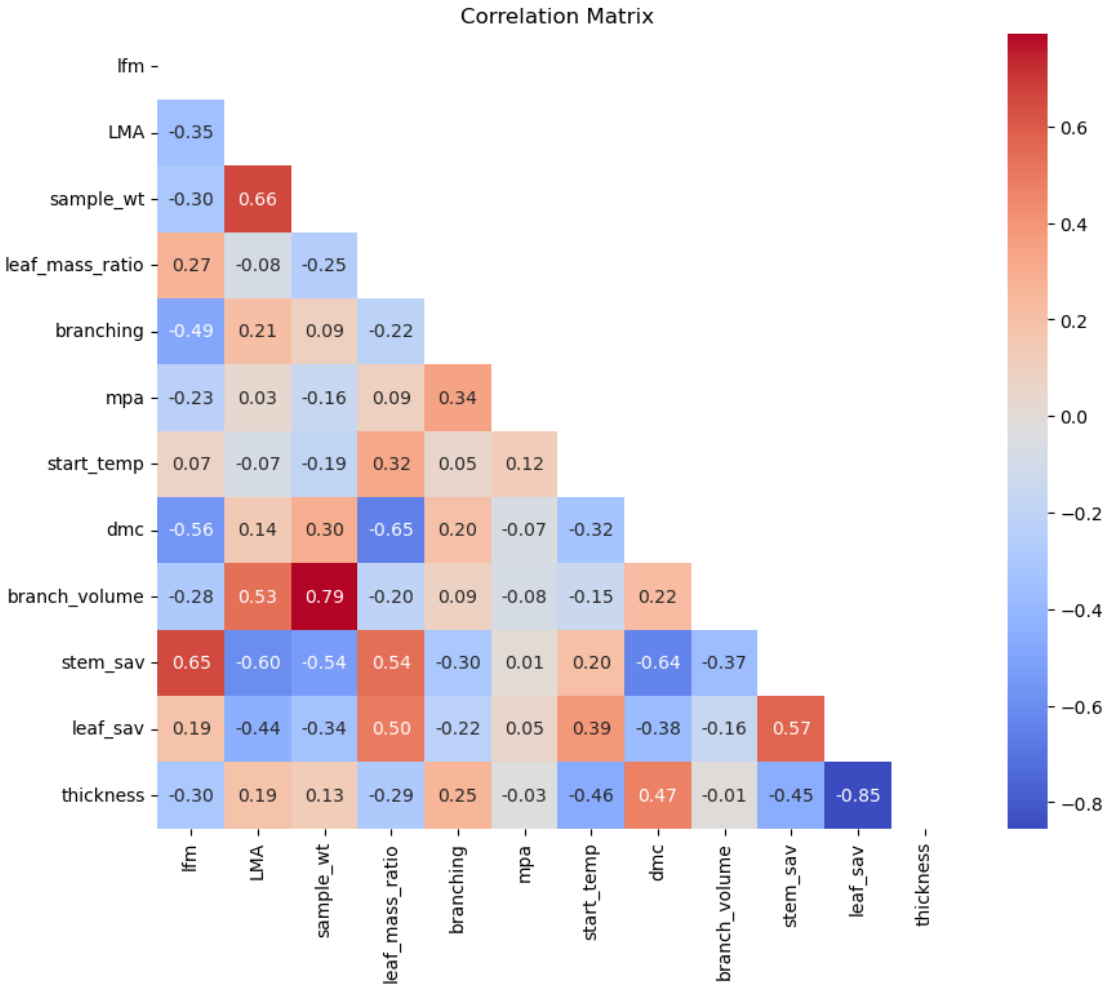
	branching	sample_density	dw_sppdev	plant_id
0	0.416667	0.004923	0.923122	1_ARCDEN
1	0.322581	0.004303	1.348152	1_ARCDEN
2	0.294118	0.007766	0.900752	1_ARCDEN
3	0.466667	0.004196	0.900752	1_ARCDEN
4	0.500000	0.004086	-0.553297	1_ARCDEN

[5 rows x 81 columns]

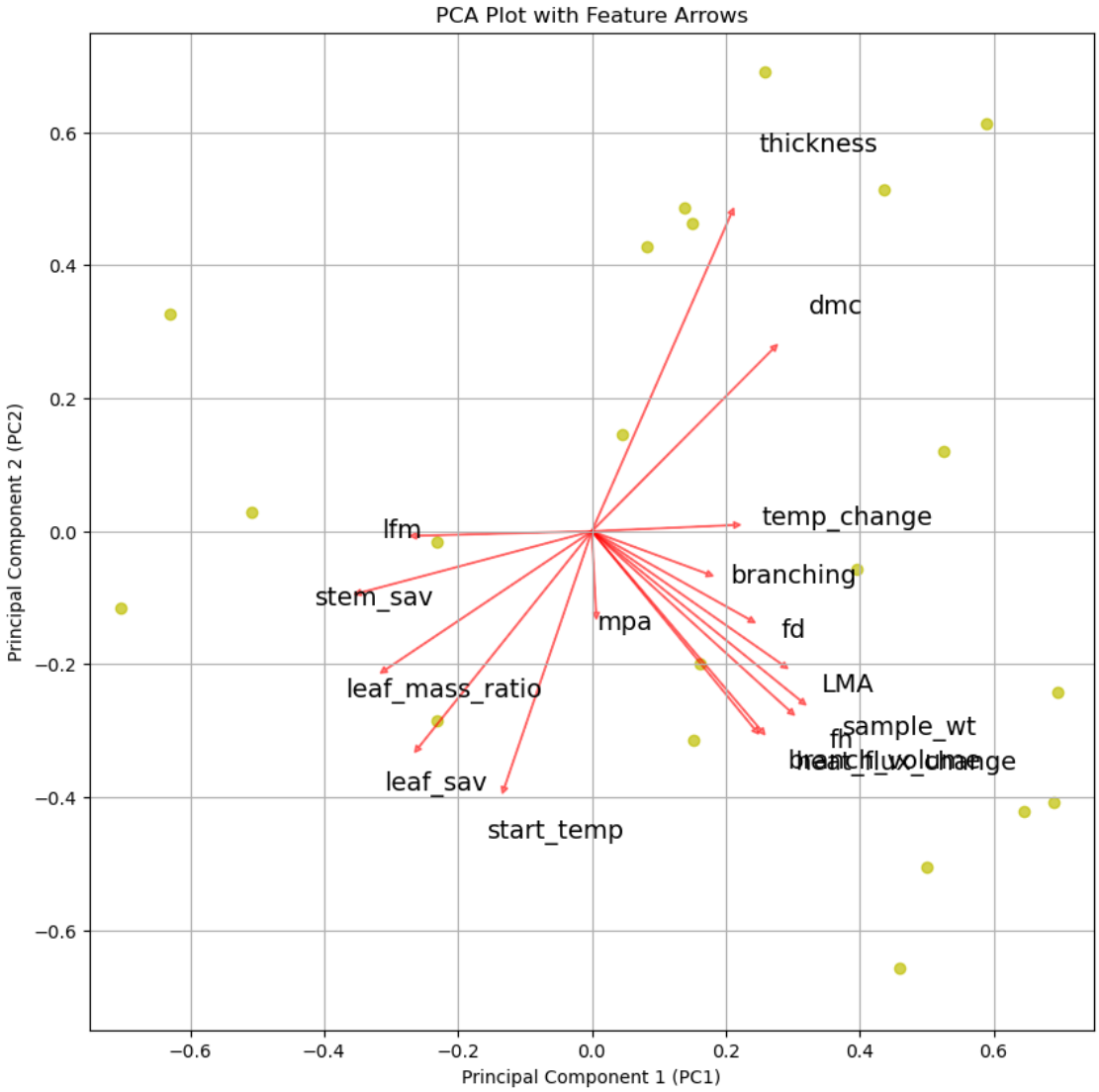
1 Examine Correlation & Structure in Num. Var's

[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 = len(cols_use) #5
mns = 1
mxi = 5 #5
mni = 1
```

4 Flame Height

[7]:
```
yvar='fh'
cols=cols_use
df=flam

compare_predictors_mixedeff(df, cols, yvar)
```

	cols	aics	pvals	coefs	top_mod
0	mpa	348.953488	0.020467	7.757524e-01	True
1	leaf_sav	348.840407	-0.044770	6.604181e-01	True
2	thickness	348.832041	-0.040855	6.522019e-01	True
3	dmc	348.510981	0.068659	4.682279e-01	True
4	leaf_mass_ratio	347.832781	-0.120260	2.694377e-01	True
5	start_temp	345.657175	0.133740	6.423671e-02	False
6	lfm	344.576424	-0.306653	3.468785e-02	False
7	stem_sav	344.331290	-0.498367	6.173055e-04	False

```
8               LMA  341.248709  0.391200  2.603875e-03    False
9         branching  339.713739  0.199225  1.947306e-03    False
10          species  338.894950 -0.248310  5.202114e-01    False
11    branch_volume  334.006737  0.253649  6.808868e-05    False
12        sample_wt  306.849369  0.466529  4.664215e-12    False
```

[8]:
```
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: {'leaf_sav', 'thickness', 'dmc',
'mpa'}

Total Num. Cols : Num. Sig. Int. Cols;  13 : 4

Significant Interactions:
('mpa', 'leaf_sav')
('mpa', 'thickness')
('mpa', 'dmc')

Number of formulas: 9728
ERROR: Formula model error: fh ~ mpa*thickness + lfm + LMA + sample_wt +
stem_sav + leaf_sav + species

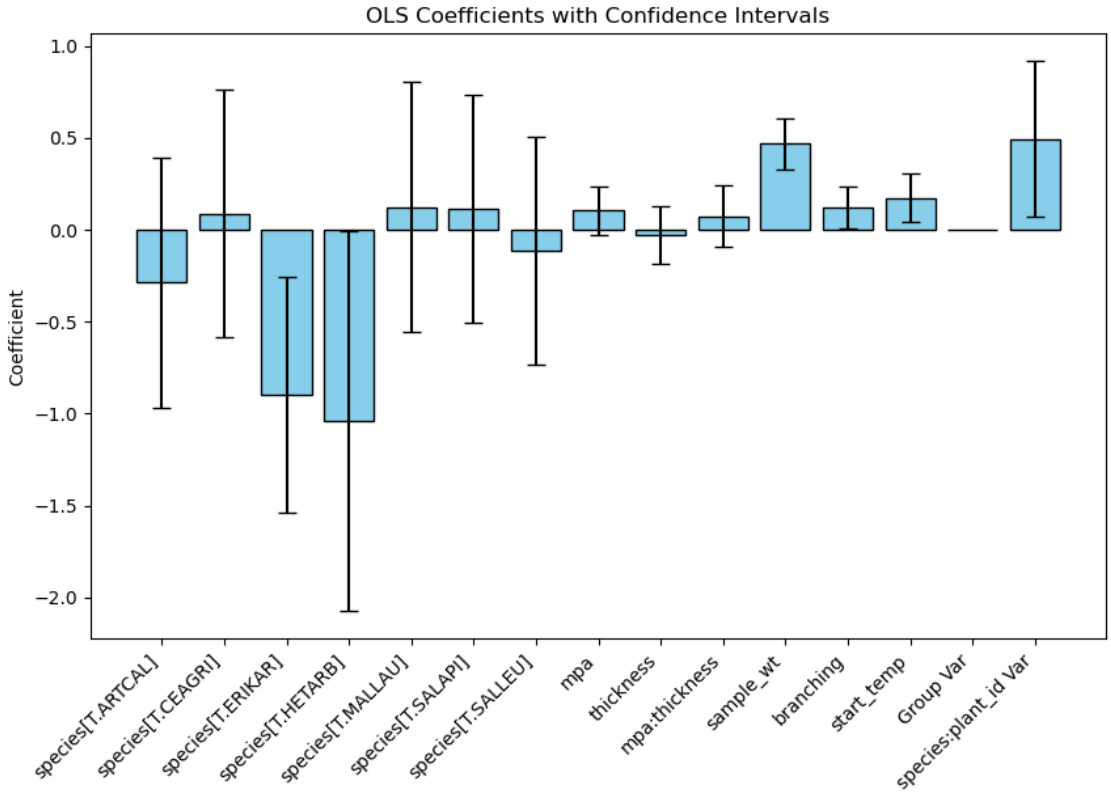

fh ~ mpa*thickness + sample_wt + branching + start_temp + species
fh ~ mpa*leaf_sav + sample_wt + branching + start_temp + species
fh ~ mpa*thickness + sample_wt + branching + start_temp + stem_sav
fh ~ mpa*leaf_sav + sample_wt + branching + start_temp + stem_sav
fh ~ mpa*thickness + sample_wt + branching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

```
fh ~ mpa*dmc + sample_wt + branching + start_temp + stem_sav
fh ~ mpa*thickness + sample_wt + branching + start_temp + dmc + species
```

Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fh
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.2234
Min. group size:	2	Log-Likelihood:	-131.1597
Max. group size:	37	Converged:	No
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.222	0.275	0.807	0.420	-0.317	0.760
species[T.ARTCAL]	-0.288	0.348	-0.828	0.408	-0.969	0.394
species[T.CEAGRI]	0.087	0.343	0.253	0.800	-0.586	0.759
species[T.ERIKAR]	-0.896	0.328	-2.732	0.006	-1.539	-0.253
species[T.HETARB]	-1.040	0.527	-1.972	0.049	-2.074	-0.006
species[T.MALLAU]	0.124	0.346	0.357	0.721	-0.555	0.802
species[T.SALAPI]	0.113	0.316	0.356	0.722	-0.507	0.733
species[T.SALLEU]	-0.114	0.317	-0.361	0.718	-0.736	0.507
mpa	0.104	0.067	1.544	0.123	-0.028	0.236
thickness	-0.029	0.081	-0.352	0.725	-0.188	0.131
mpa:thickness	0.074	0.085	0.869	0.385	-0.092	0.240
sample_wt	0.468	0.070	6.686	0.000	0.331	0.605
branching	0.121	0.059	2.057	0.040	0.006	0.236
start_temp	0.174	0.069	2.533	0.011	0.039	0.310
Group Var	0.000					
species:plant_id Var	0.110	0.102				

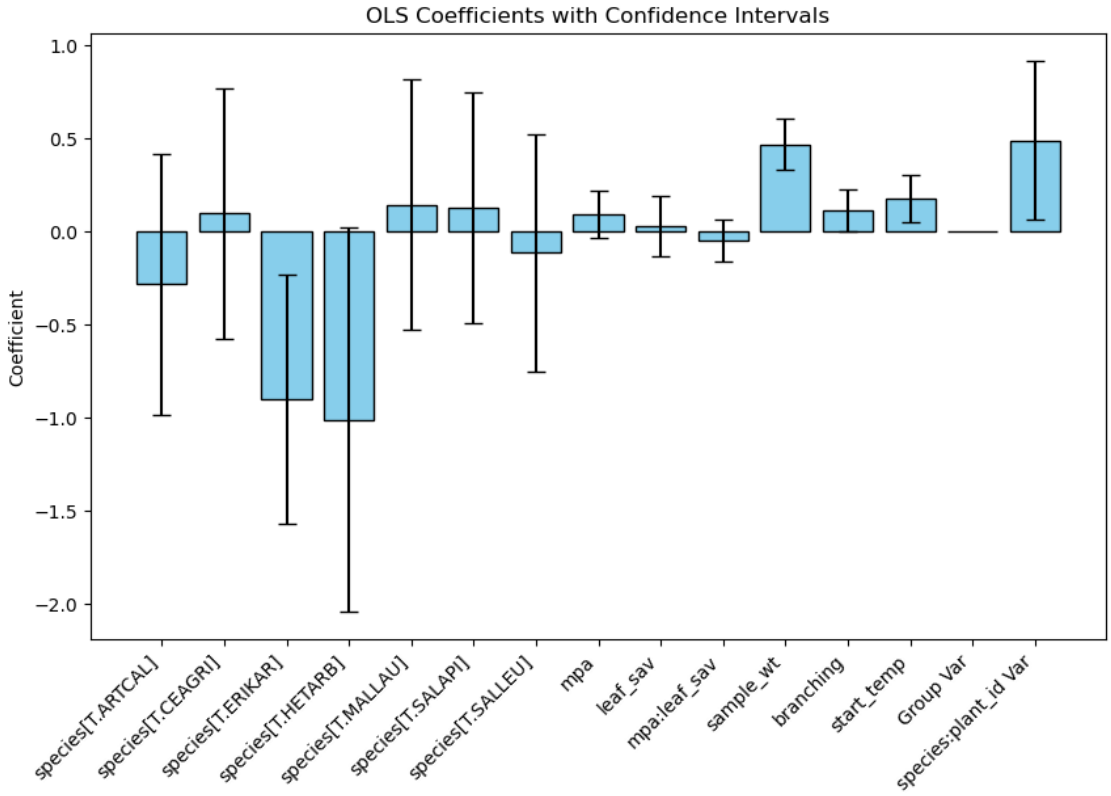


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fh
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.2240
Min. group size:	2	Log-Likelihood:	-131.3050
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

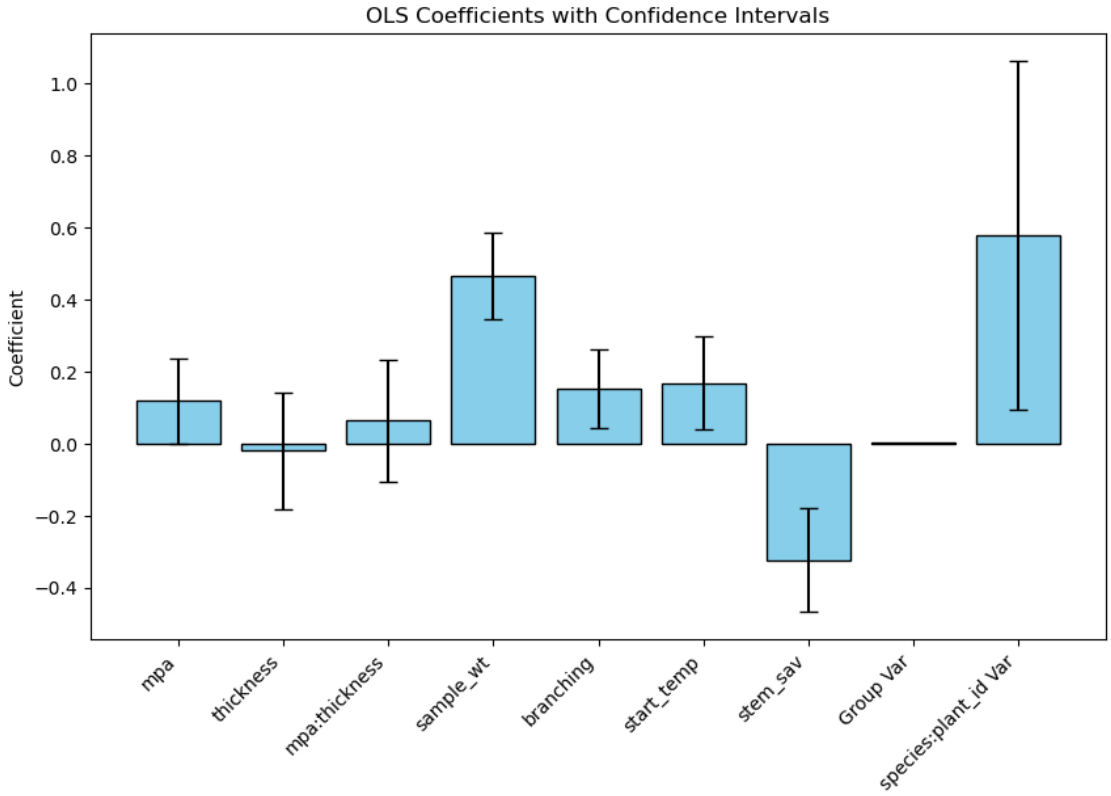
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.213	0.278	0.765	0.444	-0.332	0.757
species[T.ARTCAL]	-0.280	0.357	-0.784	0.433	-0.980	0.420
species[T.CEAGRI]	0.099	0.343	0.288	0.773	-0.574	0.772
species[T.ERIKAR]	-0.897	0.341	-2.628	0.009	-1.566	-0.228
species[T.HETARB]	-1.010	0.526	-1.921	0.055	-2.041	0.021
species[T.MALLAU]	0.146	0.342	0.426	0.670	-0.525	0.817
species[T.SALAPI]	0.129	0.315	0.410	0.682	-0.489	0.748
species[T.SALLEU]	-0.112	0.324	-0.345	0.730	-0.748	0.524
mpa	0.093	0.064	1.453	0.146	-0.033	0.219
leaf_sav	0.031	0.082	0.376	0.707	-0.129	0.191
mpa:leaf_sav	-0.045	0.057	-0.782	0.434	-0.157	0.068

```
sample_wt             0.470    0.070  6.687 0.000  0.332  0.608
branching             0.117    0.058  2.009 0.045  0.003  0.231
start_temp            0.176    0.065  2.710 0.007  0.049  0.303
Group Var             0.000
species:plant_id Var  0.110    0.103
=============================================================
```



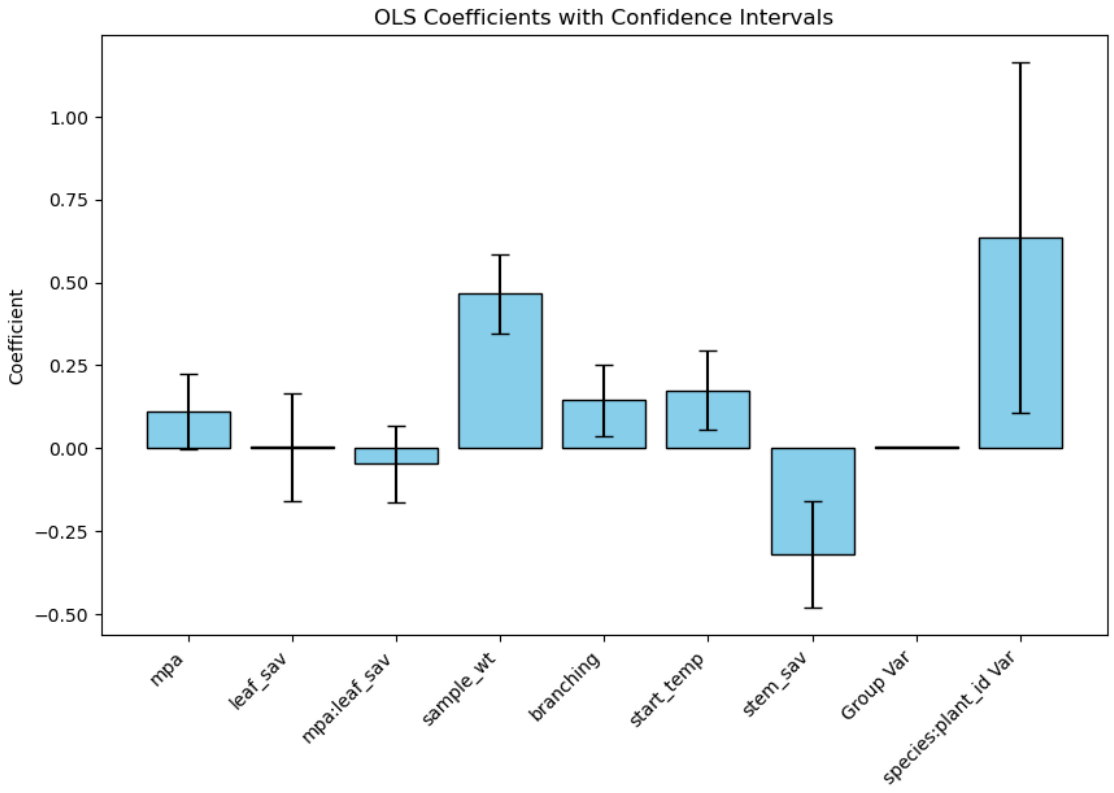

```
            Mixed Linear Model Regression Results
============================================================
Model:               MixedLM   Dependent Variable:   fh
No. Observations:    162       Method:               ML
No. Groups:          8         Scale:                0.2345
Min. group size:     2         Log-Likelihood:       -137.4452
Max. group size:     37        Converged:            Yes
Mean group size:     20.2
------------------------------------------------------------
                    Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept            0.015    0.067  0.220 0.826 -0.117  0.146
mpa                  0.118    0.061  1.939 0.052 -0.001  0.237
thickness           -0.020    0.082 -0.247 0.805 -0.181  0.141
```

```
mpa:thickness          0.064    0.086  0.746 0.456 -0.104  0.233
sample_wt              0.465    0.062  7.504 0.000  0.344  0.587
branching              0.151    0.056  2.725 0.006  0.042  0.260
start_temp             0.169    0.065  2.594 0.009  0.041  0.296
stem_sav              -0.324    0.073 -4.427 0.000 -0.467 -0.180
Group Var              0.000
species:plant_id Var   0.136    0.119
============================================================
```



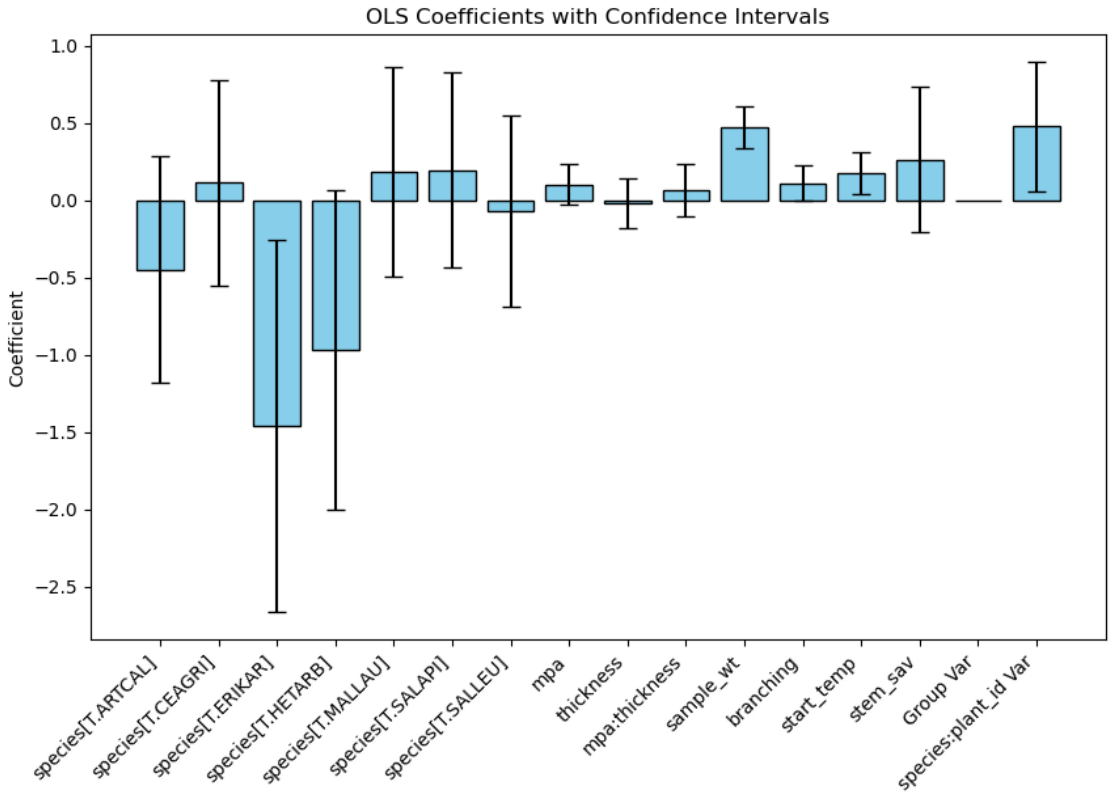

```
            Mixed Linear Model Regression Results
============================================================
Model:               MixedLM   Dependent Variable:   fh
No. Observations:    162       Method:               ML
No. Groups:          8         Scale:                0.2302
Min. group size:     2         Log-Likelihood:       -137.5326
Max. group size:     37        Converged:            No
Mean group size:     20.2
------------------------------------------------------------
                     Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept            0.016    0.069  0.236 0.814 -0.119  0.152
```

```
mpa                    0.109    0.058  1.880 0.060 -0.005  0.223
leaf_sav               0.003    0.084  0.040 0.968 -0.161  0.167
mpa:leaf_sav          -0.047    0.059 -0.803 0.422 -0.162  0.068
sample_wt              0.466    0.062  7.550 0.000  0.345  0.586
branching              0.145    0.055  2.637 0.008  0.037  0.253
start_temp             0.174    0.061  2.852 0.004  0.055  0.294
stem_sav              -0.320    0.083 -3.872 0.000 -0.482 -0.158
Group Var              0.001
species:plant_id Var   0.146    0.129
============================================================
```



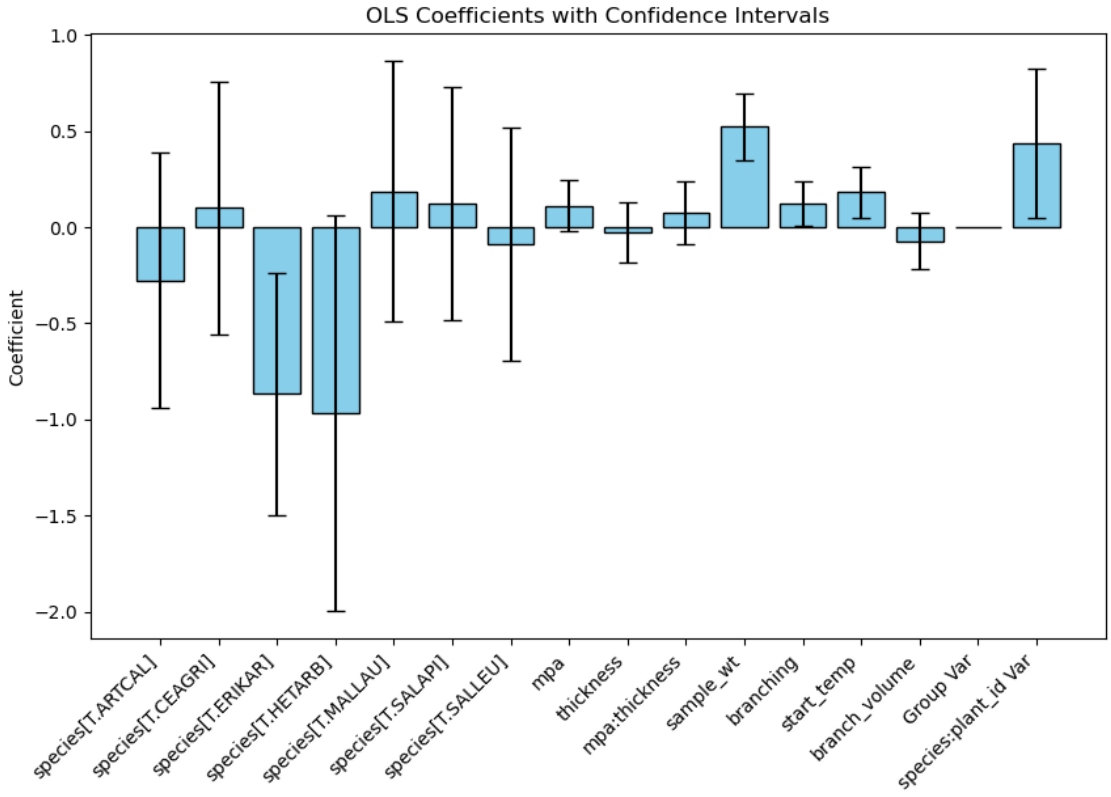

```
            Mixed Linear Model Regression Results
============================================================
Model:               MixedLM   Dependent Variable:   fh
No. Observations:    162       Method:               ML
No. Groups:          8         Scale:                0.2231
Min. group size:     2         Log-Likelihood:       -130.5354
Max. group size:     37        Converged:            Yes
Mean group size:     20.2
------------------------------------------------------------
                    Coef.  Std.Err.   z    P>|z| [0.025 0.975]
```

```
----------------------------------------------------------------
Intercept              0.328    0.290  1.132 0.258 -0.240  0.897
species[T.ARTCAL]     -0.449    0.375 -1.196 0.232 -1.184  0.287
species[T.CEAGRI]      0.113    0.340  0.331 0.741 -0.555  0.780
species[T.ERIKAR]     -1.463    0.614 -2.383 0.017 -2.666 -0.260
species[T.HETARB]     -0.972    0.527 -1.842 0.065 -2.005  0.062
species[T.MALLAU]      0.184    0.347  0.529 0.597 -0.497  0.865
species[T.SALAPI]      0.196    0.322  0.609 0.542 -0.435  0.827
species[T.SALLEU]     -0.072    0.316 -0.229 0.819 -0.691  0.546
mpa                    0.102    0.067  1.525 0.127 -0.029  0.234
thickness             -0.018    0.081 -0.220 0.826 -0.177  0.141
mpa:thickness          0.065    0.085  0.766 0.444 -0.101  0.231
sample_wt              0.475    0.070  6.781 0.000  0.338  0.612
branching              0.112    0.059  1.890 0.059 -0.004  0.227
start_temp             0.178    0.069  2.586 0.010  0.043  0.312
stem_sav               0.263    0.240  1.096 0.273 -0.207  0.734
Group Var              0.000
species:plant_id Var   0.106    0.101
================================================================
```



Mixed Linear Model Regression Results

```
============================================================
Model:                MixedLM   Dependent Variable:   fh
No. Observations:     162       Method:               ML
No. Groups:           8         Scale:                0.2272
Min. group size:      2         Log-Likelihood:       -130.6487
Max. group size:      37        Converged:            Yes
Mean group size:      20.2
------------------------------------------------------------
                     Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept             0.195    0.270  0.724 0.469 -0.334  0.724
species[T.ARTCAL]    -0.277    0.340 -0.813 0.416 -0.943  0.390
species[T.CEAGRI]     0.100    0.335  0.300 0.765 -0.557  0.757
species[T.ERIKAR]    -0.867    0.321 -2.696 0.007 -1.497 -0.237
species[T.HETARB]    -0.967    0.526 -1.839 0.066 -1.997  0.064
species[T.MALLAU]     0.187    0.346  0.540 0.589 -0.490  0.864
species[T.SALAPI]     0.124    0.309  0.401 0.688 -0.482  0.730
species[T.SALLEU]    -0.090    0.309 -0.290 0.771 -0.695  0.516
mpa                   0.110    0.067  1.640 0.101 -0.022  0.242
thickness            -0.030    0.080 -0.376 0.707 -0.187  0.127
mpa:thickness         0.076    0.084  0.903 0.367 -0.089  0.242
sample_wt             0.522    0.089  5.859 0.000  0.348  0.697
branching             0.124    0.059  2.111 0.035  0.009  0.239
start_temp            0.181    0.069  2.625 0.009  0.046  0.316
branch_volume        -0.072    0.076 -0.948 0.343 -0.221  0.077
Group Var             0.000
species:plant_id Var  0.099    0.095
============================================================
```

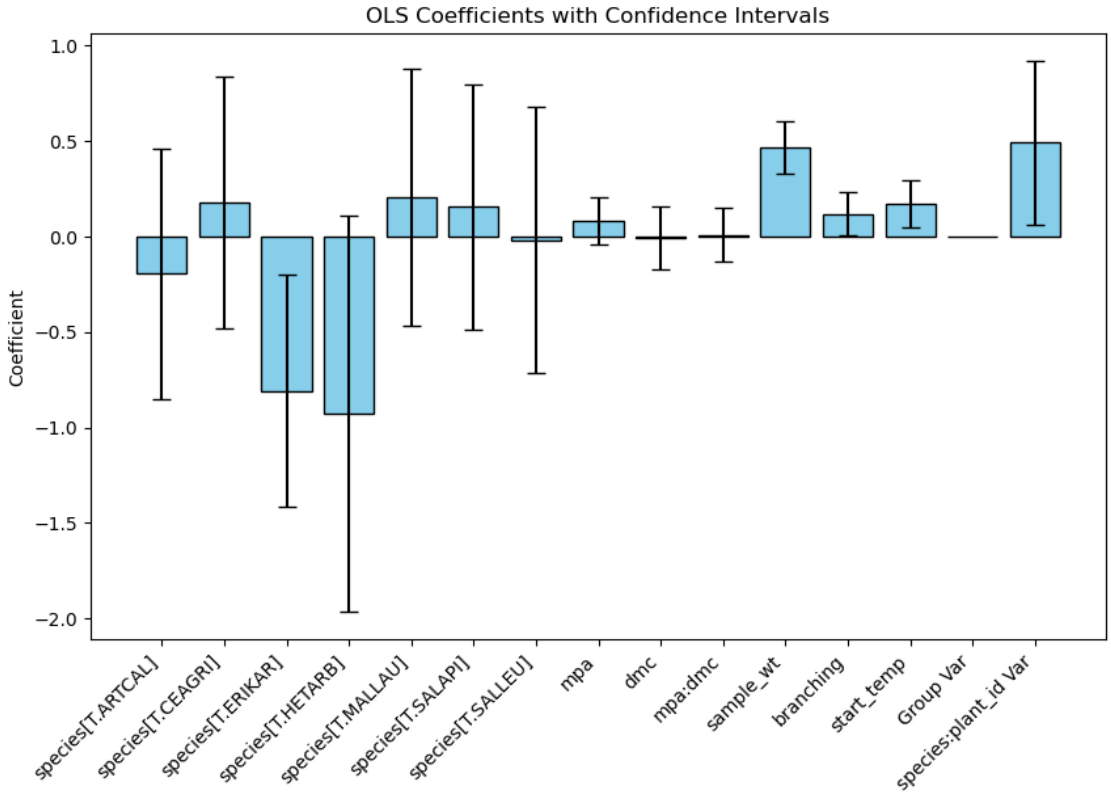


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fh
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.2251
Min. group size:	2	Log-Likelihood:	-131.6558
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

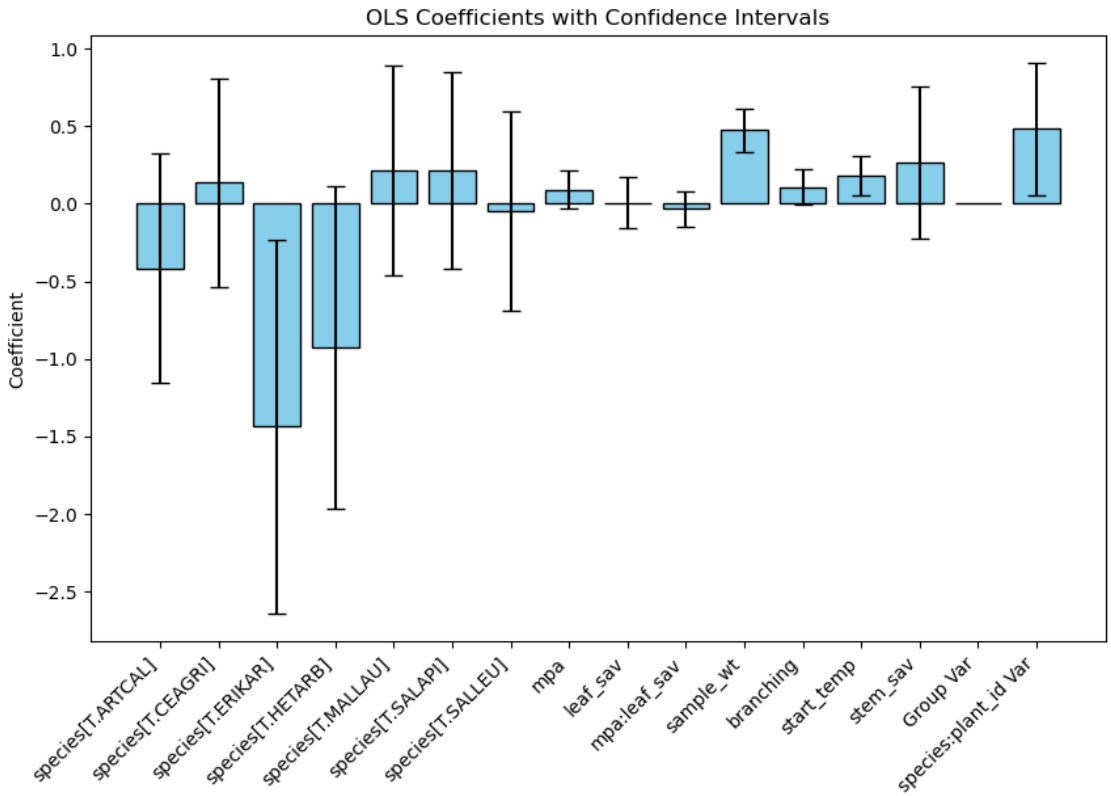
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.145	0.271	0.536	0.592	-0.386	0.677
species[T.ARTCAL]	-0.196	0.334	-0.587	0.557	-0.850	0.459
species[T.CEAGRI]	0.180	0.336	0.536	0.592	-0.478	0.839
species[T.ERIKAR]	-0.809	0.309	-2.615	0.009	-1.415	-0.203
species[T.HETARB]	-0.929	0.529	-1.756	0.079	-1.966	0.108
species[T.MALLAU]	0.203	0.343	0.590	0.555	-0.471	0.876
species[T.SALAPI]	0.156	0.328	0.474	0.635	-0.488	0.799
species[T.SALLEU]	-0.020	0.355	-0.057	0.954	-0.717	0.676
mpa	0.084	0.064	1.315	0.188	-0.041	0.208
dmc	-0.008	0.084	-0.101	0.919	-0.172	0.155
mpa:dmc	0.009	0.071	0.120	0.904	-0.131	0.148

```
sample_wt             0.464    0.071  6.580 0.000  0.326  0.603
branching             0.119    0.058  2.048 0.041  0.005  0.233
start_temp            0.171    0.062  2.745 0.006  0.049  0.292
Group Var             0.000
species:plant_id Var  0.110    0.104
============================================================
```



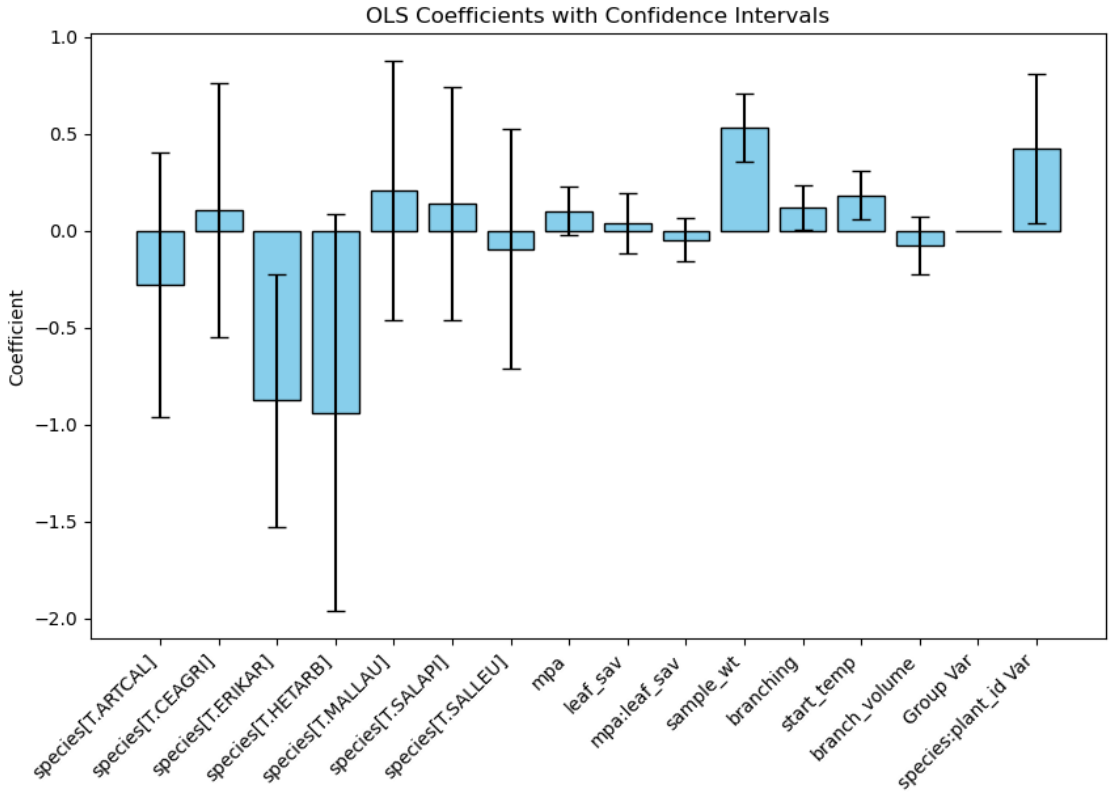

```
            Mixed Linear Model Regression Results
============================================================
Model:               MixedLM   Dependent Variable:   fh
No. Observations:    162       Method:               ML
No. Groups:          8         Scale:                0.2231
Min. group size:     2         Log-Likelihood:       -130.7320
Max. group size:     37        Converged:            Yes
Mean group size:     20.2
------------------------------------------------------------
                    Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept            0.304    0.290  1.048 0.294 -0.265  0.873
species[T.ARTCAL]   -0.416    0.378 -1.101 0.271 -1.157  0.325
species[T.CEAGRI]    0.138    0.343  0.403 0.687 -0.534  0.810
```

```
species[T.ERIKAR]     -1.437    0.616 -2.331 0.020 -2.645 -0.229
species[T.HETARB]     -0.927    0.529 -1.753 0.080 -1.964  0.109
species[T.MALLAU]      0.216    0.347  0.623 0.533 -0.464  0.895
species[T.SALAPI]      0.215    0.323  0.664 0.506 -0.419  0.848
species[T.SALLEU]     -0.048    0.327 -0.148 0.883 -0.690  0.593
mpa                    0.092    0.064  1.430 0.153 -0.034  0.217
leaf_sav               0.006    0.084  0.073 0.942 -0.159  0.172
mpa:leaf_sav          -0.034    0.058 -0.590 0.555 -0.148  0.080
sample_wt              0.475    0.070  6.760 0.000  0.337  0.613
branching              0.109    0.059  1.855 0.064 -0.006  0.224
start_temp             0.179    0.065  2.769 0.006  0.052  0.306
stem_sav               0.265    0.251  1.055 0.291 -0.227  0.756
Group Var              0.000
species:plant_id Var   0.108    0.102
============================================================
```




```
            Mixed Linear Model Regression Results
============================================================
Model:               MixedLM   Dependent Variable:   fh
No. Observations:    162       Method:               ML
No. Groups:          8         Scale:                0.2283
```

```
Min. group size:      2         Log-Likelihood:       -130.7362
Max. group size:      37        Converged:            Yes
Mean group size:      20.2
-------------------------------------------------------------
                     Coef.  Std.Err.   z    P>|z| [0.025 0.975]
-------------------------------------------------------------
Intercept             0.191    0.272  0.703 0.482 -0.342  0.724
species[T.ARTCAL]    -0.279    0.349 -0.799 0.424 -0.962  0.405
species[T.CEAGRI]     0.107    0.334  0.322 0.748 -0.547  0.762
species[T.ERIKAR]    -0.877    0.333 -2.637 0.008 -1.529 -0.225
species[T.HETARB]    -0.939    0.523 -1.796 0.073 -1.963  0.086
species[T.MALLAU]     0.208    0.340  0.611 0.541 -0.459  0.875
species[T.SALAPI]     0.141    0.308  0.457 0.648 -0.462  0.743
species[T.SALLEU]    -0.094    0.315 -0.298 0.766 -0.711  0.523
mpa                   0.101    0.064  1.564 0.118 -0.025  0.227
leaf_sav              0.038    0.080  0.480 0.631 -0.118  0.195
mpa:leaf_sav         -0.049    0.057 -0.864 0.388 -0.161  0.063
sample_wt             0.530    0.090  5.872 0.000  0.353  0.707
branching             0.120    0.058  2.065 0.039  0.006  0.235
start_temp            0.182    0.065  2.813 0.005  0.055  0.309
branch_volume        -0.077    0.077 -1.005 0.315 -0.227  0.073
Group Var             0.000
species:plant_id Var  0.097    0.094
=============================================================
```

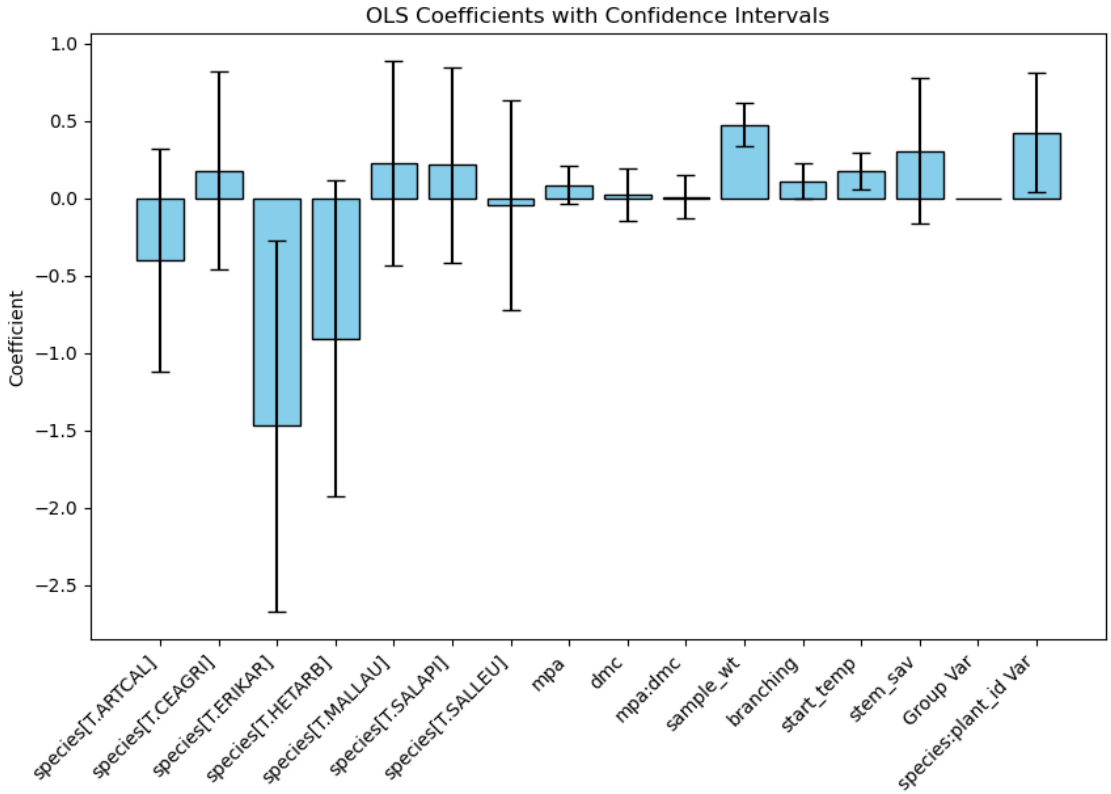


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fh
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.2287
Min. group size:	2	Log-Likelihood:	-130.8000
Max. group size:	37	Converged:	No
Mean group size:	20.2		

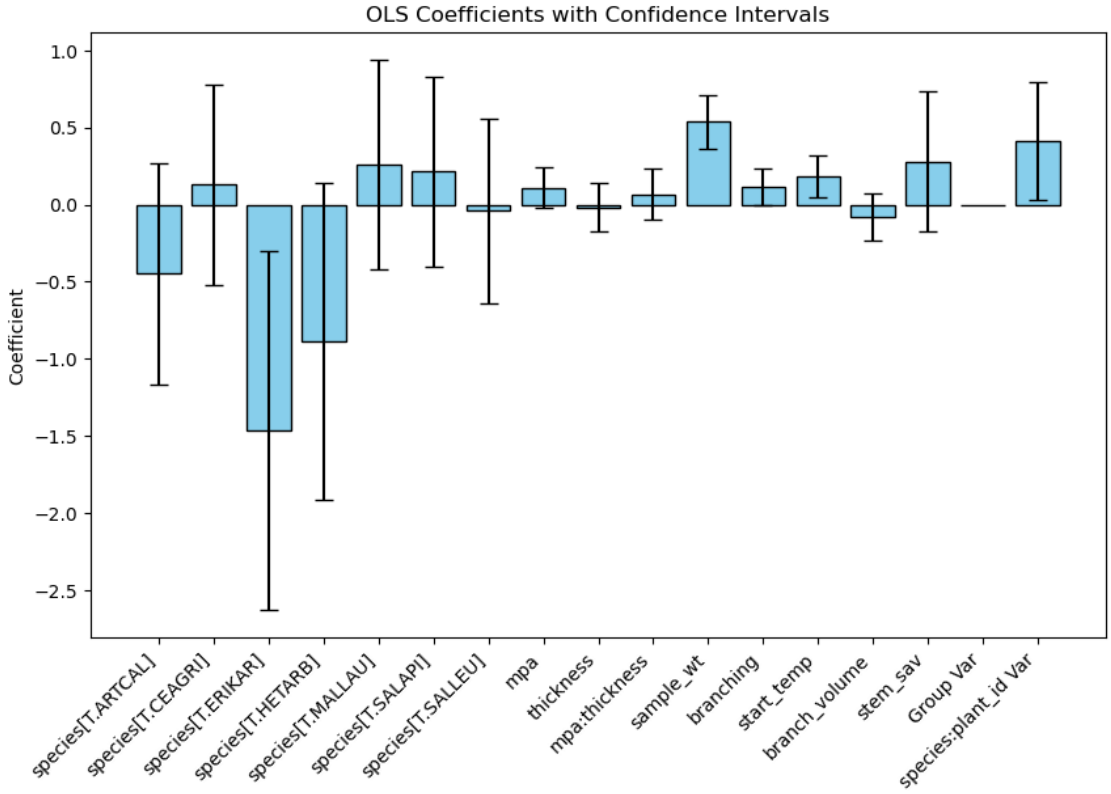
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.302	0.294	1.025	0.305	-0.275	0.878
species[T.ARTCAL]	-0.402	0.366	-1.097	0.272	-1.119	0.316
species[T.CEAGRI]	0.178	0.326	0.545	0.586	-0.462	0.817
species[T.ERIKAR]	-1.473	0.613	-2.402	0.016	-2.674	-0.271
species[T.HETARB]	-0.908	0.521	-1.744	0.081	-1.929	0.113
species[T.MALLAU]	0.227	0.336	0.674	0.500	-0.432	0.885
species[T.SALAPI]	0.215	0.323	0.665	0.506	-0.418	0.848
species[T.SALLEU]	-0.045	0.347	-0.129	0.897	-0.725	0.635
mpa	0.083	0.063	1.320	0.187	-0.040	0.207
dmc	0.023	0.086	0.262	0.793	-0.146	0.192
mpa:dmc	0.009	0.071	0.124	0.902	-0.130	0.147

```
sample_wt              0.474    0.071  6.696 0.000  0.335  0.612
branching              0.109    0.059  1.869 0.062 -0.005  0.224
start_temp             0.175    0.062  2.833 0.005  0.054  0.295
stem_sav               0.304    0.240  1.266 0.205 -0.167  0.775
Group Var              0.000
species:plant_id Var   0.097    0.095
================================================================
```



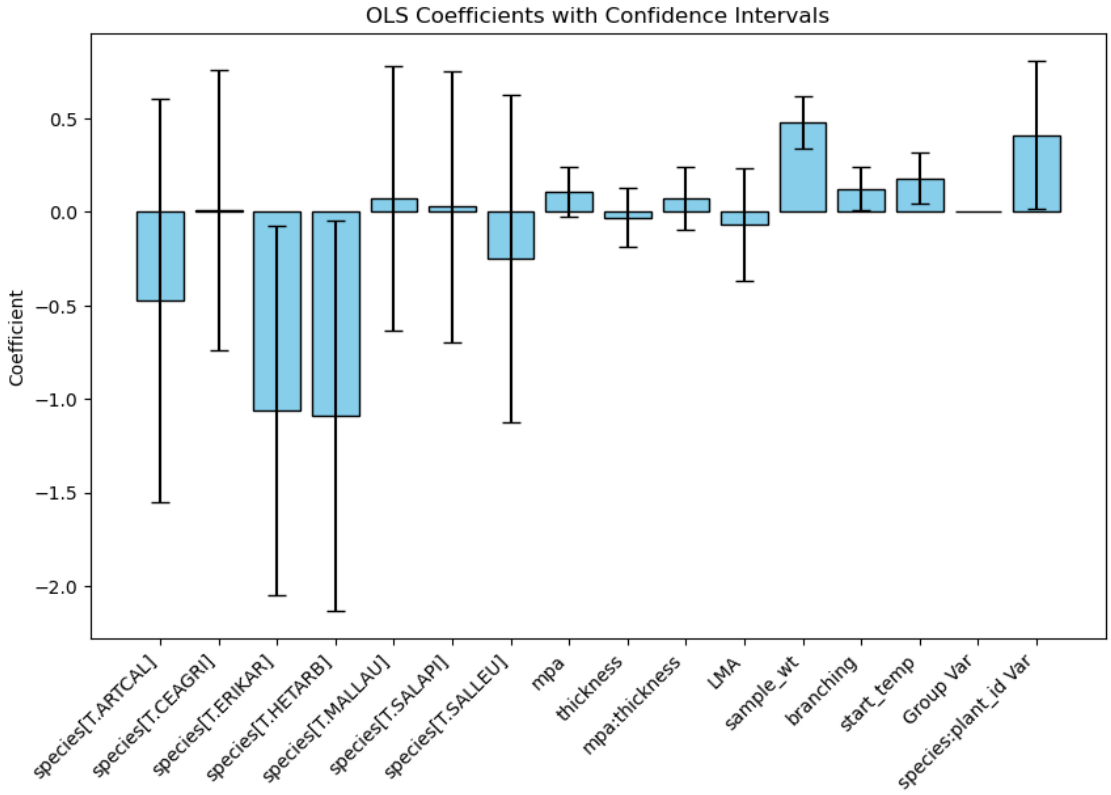

```
            Mixed Linear Model Regression Results
================================================================
Model:                MixedLM   Dependent Variable:   fh
No. Observations:     162       Method:               ML
No. Groups:           8         Scale:                0.2274
Min. group size:      2         Log-Likelihood:       -129.9376
Max. group size:      37        Converged:            No
Mean group size:      20.2
----------------------------------------------------------------
                     Coef.  Std.Err.   z    P>|z| [0.025 0.975]
----------------------------------------------------------------
Intercept             0.305    0.284  1.077 0.282 -0.251  0.861
species[T.ARTCAL]    -0.448    0.366 -1.222 0.222 -1.166  0.270
```

```
species[T.CEAGRI]     0.130    0.332  0.393 0.695 -0.520  0.781
species[T.ERIKAR]    -1.465    0.594 -2.464 0.014 -2.630 -0.300
species[T.HETARB]    -0.886    0.526 -1.685 0.092 -1.916  0.144
species[T.MALLAU]     0.258    0.347  0.744 0.457 -0.422  0.938
species[T.SALAPI]     0.214    0.314  0.681 0.496 -0.402  0.830
species[T.SALLEU]    -0.042    0.307 -0.136 0.892 -0.644  0.560
mpa                   0.109    0.067  1.629 0.103 -0.022  0.241
thickness            -0.019    0.080 -0.240 0.811 -0.175  0.137
mpa:thickness         0.067    0.084  0.791 0.429 -0.099  0.232
sample_wt             0.537    0.090  5.980 0.000  0.361  0.713
branching             0.115    0.059  1.940 0.052 -0.001  0.231
start_temp            0.185    0.069  2.695 0.007  0.050  0.319
branch_volume        -0.081    0.076 -1.055 0.292 -0.230  0.069
stem_sav              0.280    0.233  1.202 0.229 -0.176  0.736
Group Var             0.000
species:plant_id Var  0.093    0.093
================================================================
```




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

```
No. Observations:     162       Method:               ML
No. Groups:           8         Scale:                0.2302
Min. group size:      2         Log-Likelihood:       -131.0091
Max. group size:      37        Converged:            Yes
Mean group size:      20.2
-----------------------------------------------------------------
                    Coef.  Std.Err.   z    P>|z| [0.025 0.975]
-----------------------------------------------------------------
Intercept            0.327    0.367  0.890 0.374 -0.393  1.046
species[T.ARTCAL]   -0.473    0.549 -0.861 0.389 -1.549  0.604
species[T.CEAGRI]    0.010    0.381  0.026 0.979 -0.737  0.757
species[T.ERIKAR]   -1.061    0.504 -2.103 0.035 -2.050 -0.072
species[T.HETARB]   -1.089    0.532 -2.047 0.041 -2.132 -0.046
species[T.MALLAU]    0.073    0.360  0.202 0.840 -0.632  0.778
species[T.SALAPI]    0.028    0.368  0.075 0.940 -0.694  0.749
species[T.SALLEU]   -0.249    0.445 -0.559 0.576 -1.121  0.623
mpa                  0.107    0.067  1.593 0.111 -0.025  0.240
thickness           -0.031    0.080 -0.384 0.701 -0.187  0.126
mpa:thickness        0.074    0.084  0.873 0.382 -0.092  0.239
LMA                 -0.068    0.154 -0.444 0.657 -0.370  0.233
sample_wt            0.479    0.073  6.577 0.000  0.336  0.622
branching            0.123    0.059  2.080 0.038  0.007  0.239
start_temp           0.179    0.069  2.588 0.010  0.043  0.315
Group Var            0.000
species:plant_id Var 0.095    0.097
=================================================================
```

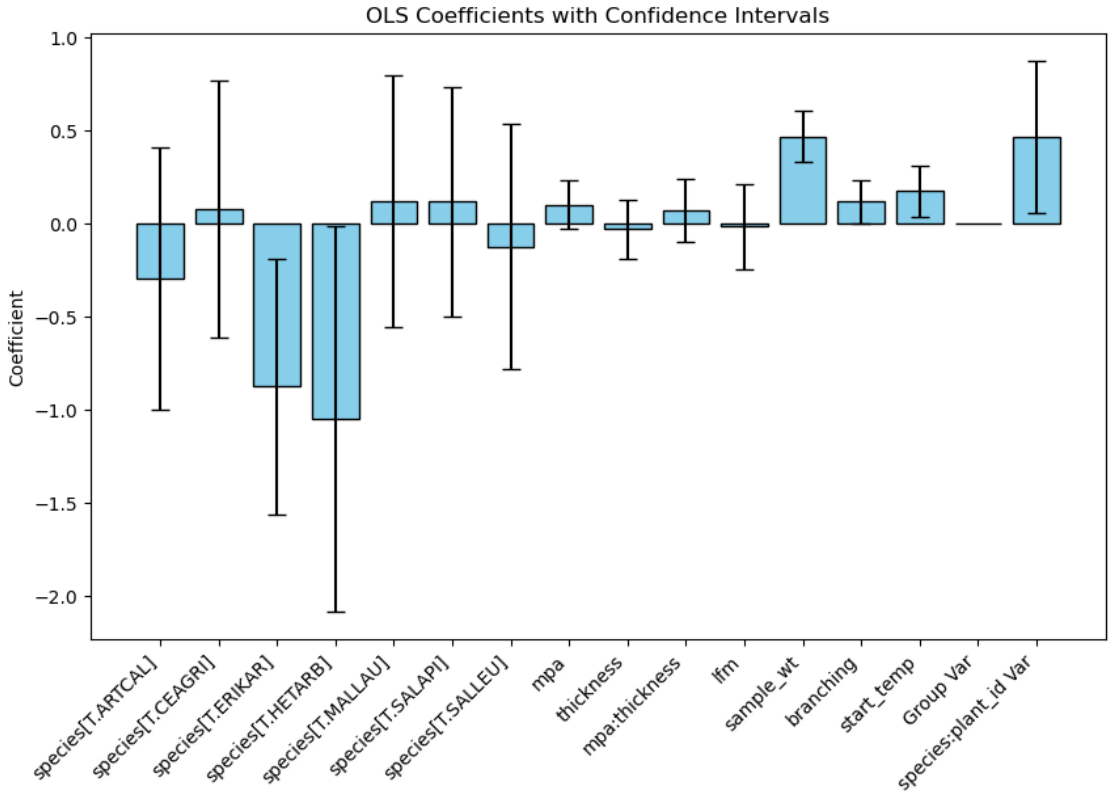


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fh
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.2258
Min. group size:	2	Log-Likelihood:	-131.0882
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

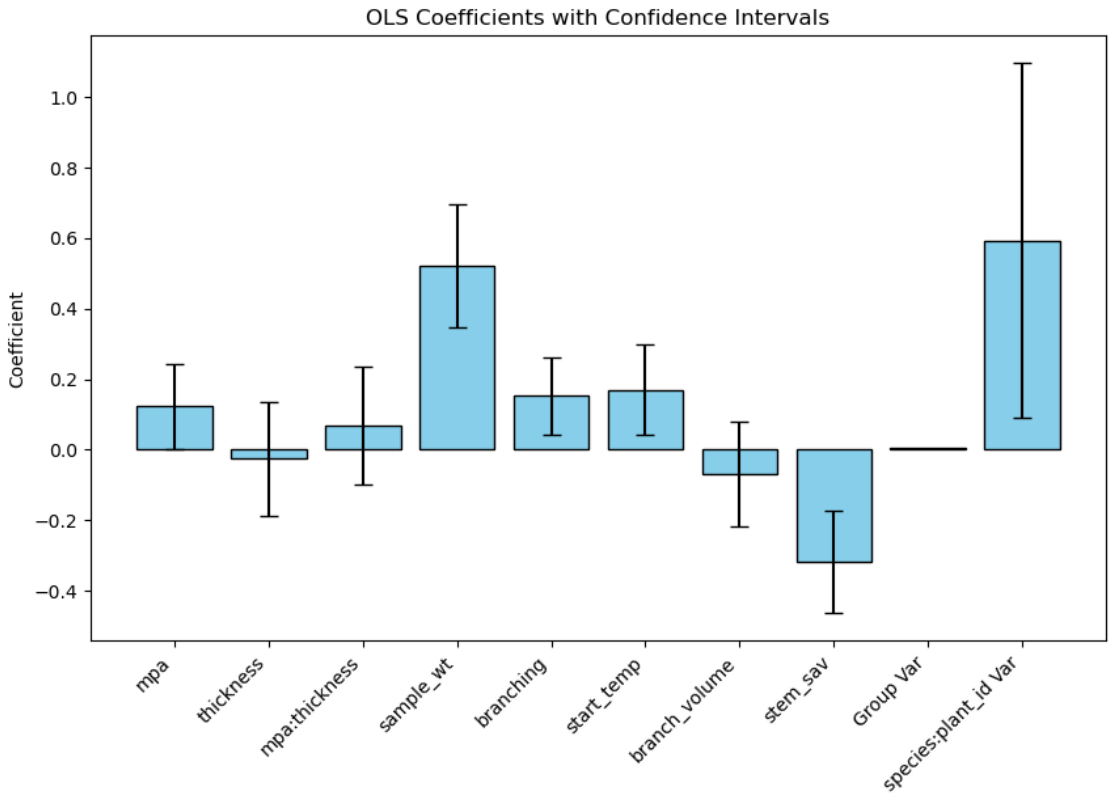
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.220	0.273	0.808	0.419	-0.314	0.755
species[T.ARTCAL]	-0.297	0.359	-0.827	0.408	-1.000	0.406
species[T.CEAGRI]	0.078	0.352	0.222	0.824	-0.611	0.767
species[T.ERIKAR]	-0.874	0.349	-2.501	0.012	-1.559	-0.189
species[T.HETARB]	-1.047	0.528	-1.983	0.047	-2.082	-0.012
species[T.MALLAU]	0.121	0.345	0.351	0.726	-0.555	0.796
species[T.SALAPI]	0.118	0.313	0.378	0.705	-0.495	0.732
species[T.SALLEU]	-0.125	0.336	-0.371	0.710	-0.782	0.533
mpa	0.104	0.067	1.536	0.124	-0.029	0.236
thickness	-0.029	0.081	-0.361	0.718	-0.188	0.130
mpa:thickness	0.073	0.085	0.858	0.391	-0.093	0.239

```
lfm                    -0.015    0.118 -0.129 0.898 -0.246  0.216
sample_wt               0.469    0.070  6.650 0.000  0.331  0.607
branching               0.119    0.060  2.002 0.045  0.003  0.236
start_temp              0.175    0.069  2.540 0.011  0.040  0.310
Group Var               0.000
species:plant_id Var    0.105    0.099
================================================================
```



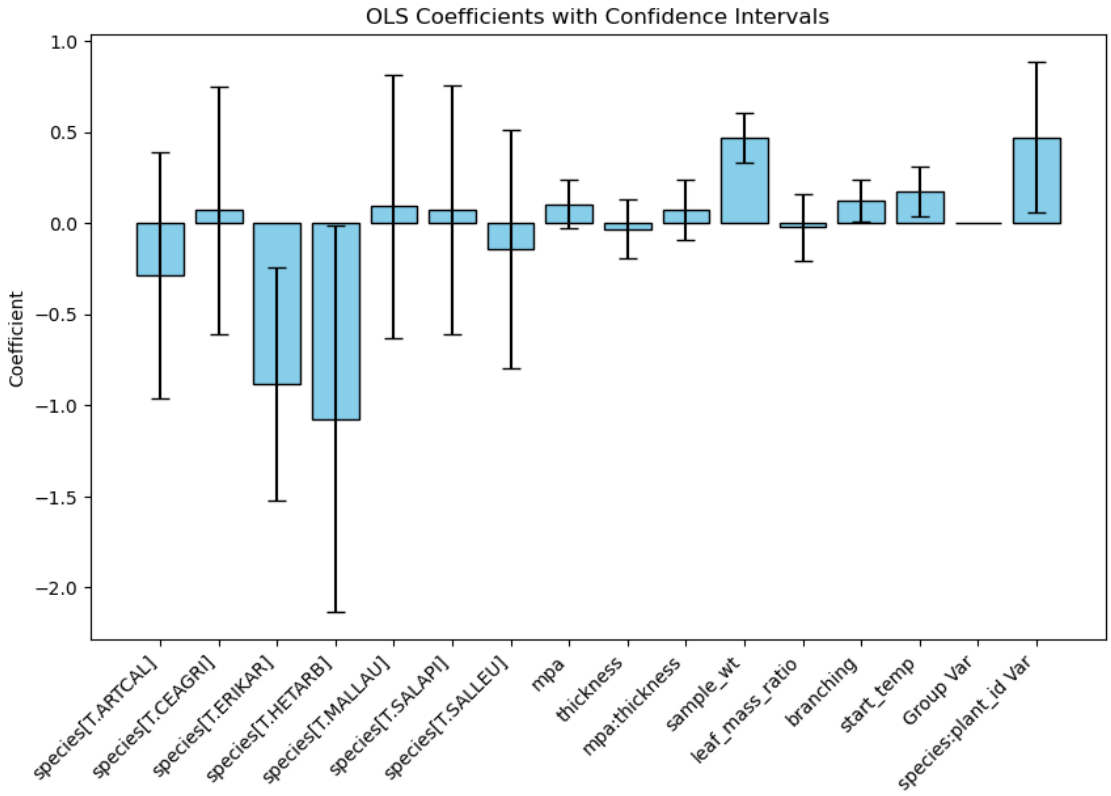

```
            Mixed Linear Model Regression Results
================================================================
Model:                MixedLM   Dependent Variable:   fh
No. Observations:     162       Method:               ML
No. Groups:           8         Scale:                0.2319
Min. group size:      2         Log-Likelihood:       -137.0909
Max. group size:      37        Converged:            No
Mean group size:      20.2
----------------------------------------------------------------
                     Coef.  Std.Err.   z    P>|z| [0.025 0.975]
----------------------------------------------------------------
Intercept             0.015    0.069  0.212 0.832 -0.120  0.149
mpa                   0.122    0.061  1.997 0.046  0.002  0.243
```

```
thickness             -0.026    0.082 -0.316 0.752 -0.187  0.135
mpa:thickness          0.068    0.086  0.794 0.427 -0.100  0.236
sample_wt              0.522    0.089  5.842 0.000  0.347  0.697
branching              0.153    0.055  2.754 0.006  0.044  0.261
start_temp             0.170    0.065  2.613 0.009  0.042  0.297
branch_volume         -0.069    0.076 -0.917 0.359 -0.218  0.079
stem_sav              -0.319    0.074 -4.323 0.000 -0.463 -0.174
Group Var              0.002
species:plant_id Var   0.138    0.124
================================================================
```



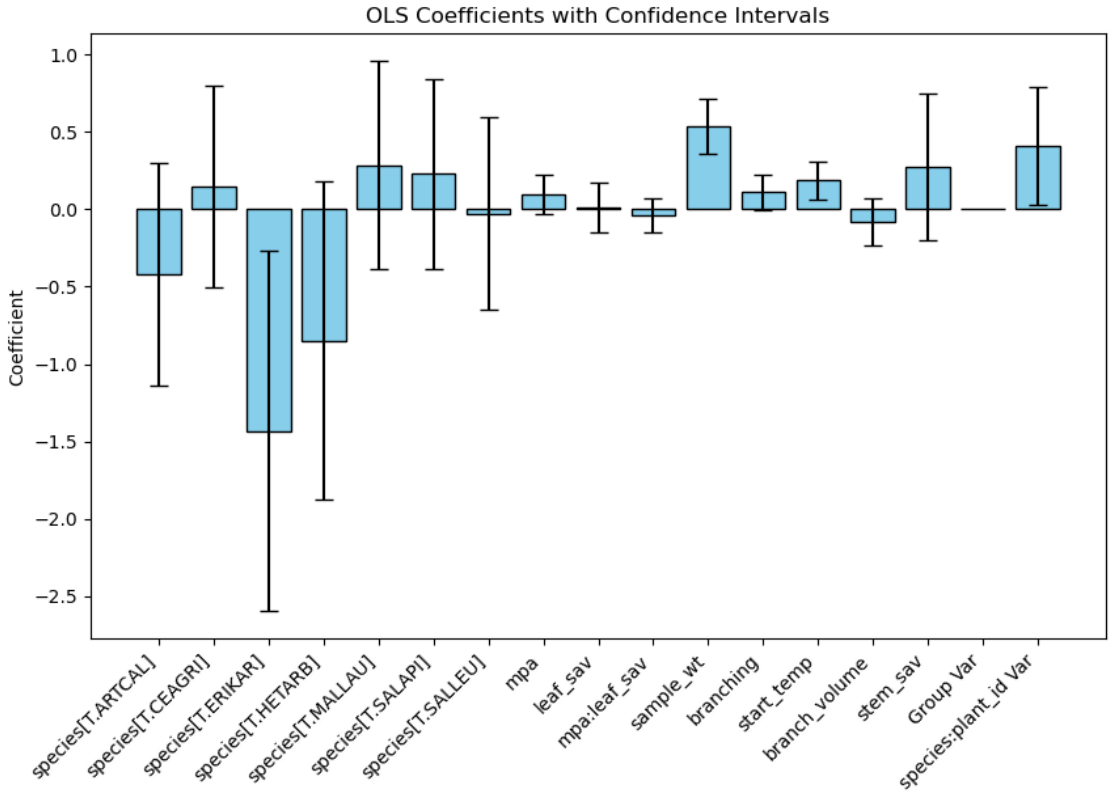

```
            Mixed Linear Model Regression Results
================================================================
Model:               MixedLM   Dependent Variable:   fh
No. Observations:    162       Method:               ML
No. Groups:          8         Scale:                0.2252
Min. group size:     2         Log-Likelihood:       -131.0983
Max. group size:     37        Converged:            Yes
Mean group size:     20.2
----------------------------------------------------------------
                    Coef.  Std.Err.   z    P>|z| [0.025 0.975]
```

```
---------------------------------------------------------------
Intercept              0.237    0.280  0.845 0.398 -0.313  0.786
species[T.ARTCAL]     -0.287    0.345 -0.831 0.406 -0.963  0.390
species[T.CEAGRI]      0.069    0.348  0.200 0.842 -0.612  0.751
species[T.ERIKAR]     -0.884    0.327 -2.700 0.007 -1.526 -0.242
species[T.HETARB]     -1.074    0.541 -1.985 0.047 -2.135 -0.014
species[T.MALLAU]      0.091    0.367  0.248 0.804 -0.628  0.810
species[T.SALAPI]      0.074    0.348  0.214 0.831 -0.608  0.756
species[T.SALLEU]     -0.142    0.334 -0.425 0.671 -0.797  0.513
mpa                    0.105    0.067  1.554 0.120 -0.027  0.236
thickness             -0.032    0.082 -0.391 0.696 -0.193  0.129
mpa:thickness          0.073    0.085  0.858 0.391 -0.093  0.239
sample_wt              0.468    0.070  6.673 0.000  0.330  0.605
leaf_mass_ratio       -0.024    0.092 -0.265 0.791 -0.204  0.155
branching              0.120    0.059  2.048 0.041  0.005  0.235
start_temp             0.175    0.069  2.538 0.011  0.040  0.310
Group Var              0.000
species:plant_id Var   0.106    0.100
===============================================================
```



Mixed Linear Model Regression Results

```
============================================================
Model:                MixedLM   Dependent Variable:   fh
No. Observations:     162       Method:               ML
No. Groups:           8         Scale:                0.2281
Min. group size:      2         Log-Likelihood:       -130.0998
Max. group size:      37        Converged:            Yes
Mean group size:      20.2
------------------------------------------------------------
                     Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------
Intercept             0.283    0.283  1.003 0.316 -0.271  0.837
species[T.ARTCAL]    -0.420    0.368 -1.142 0.254 -1.141  0.301
species[T.CEAGRI]     0.150    0.333  0.451 0.652 -0.503  0.803
species[T.ERIKAR]    -1.433    0.594 -2.411 0.016 -2.598 -0.268
species[T.HETARB]    -0.848    0.525 -1.615 0.106 -1.877  0.181
species[T.MALLAU]     0.285    0.344  0.829 0.407 -0.389  0.960
species[T.SALAPI]     0.230    0.314  0.731 0.465 -0.386  0.846
species[T.SALLEU]    -0.026    0.317 -0.082 0.935 -0.647  0.595
mpa                   0.099    0.064  1.547 0.122 -0.026  0.225
leaf_sav              0.014    0.082  0.165 0.869 -0.148  0.175
mpa:leaf_sav         -0.038    0.058 -0.656 0.512 -0.151  0.075
sample_wt             0.539    0.090  5.963 0.000  0.362  0.716
branching             0.112    0.059  1.908 0.056 -0.003  0.227
start_temp            0.186    0.065  2.886 0.004  0.060  0.313
branch_volume        -0.083    0.077 -1.076 0.282 -0.233  0.068
stem_sav              0.274    0.242  1.132 0.258 -0.200  0.747
Group Var             0.000
species:plant_id Var  0.093    0.093
============================================================
```

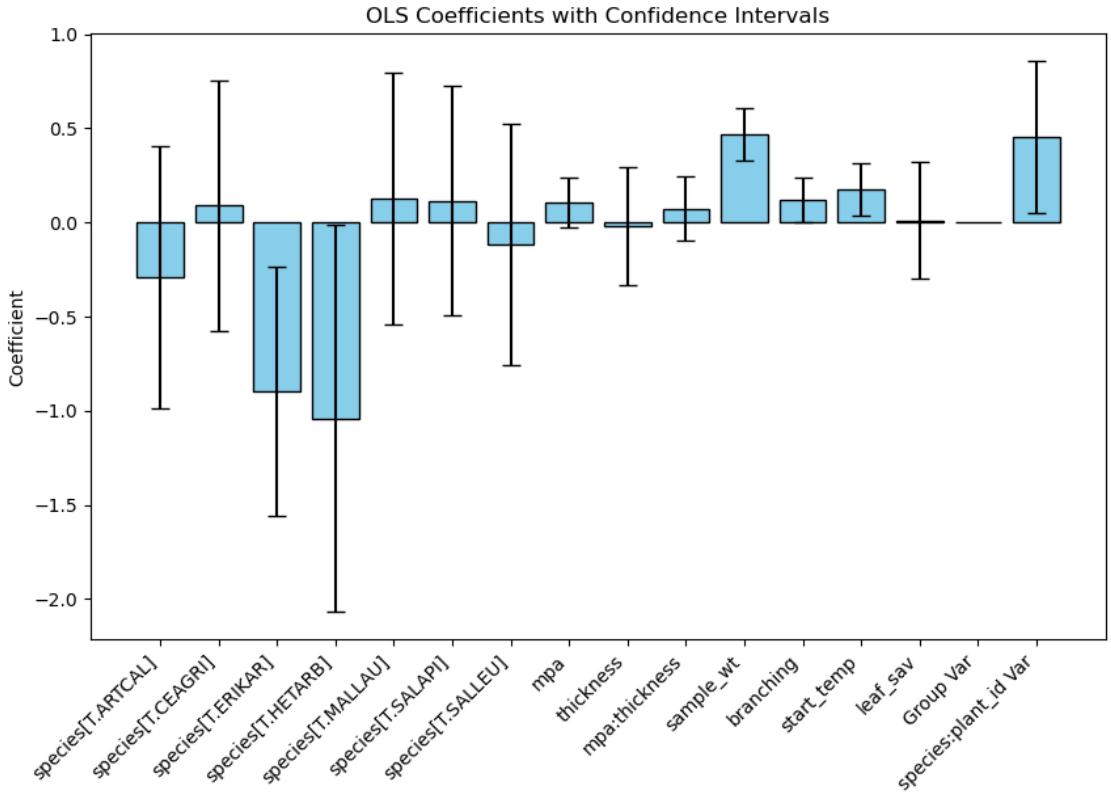


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fh
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.2267
Min. group size:	2	Log-Likelihood:	-131.1052
Max. group size:	37	Converged:	No
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.221	0.276	0.801	0.423	-0.320	0.762
species[T.ARTCAL]	-0.290	0.357	-0.814	0.416	-0.989	0.409
species[T.CEAGRI]	0.089	0.339	0.263	0.792	-0.574	0.753
species[T.ERIKAR]	-0.898	0.338	-2.652	0.008	-1.561	-0.234
species[T.HETARB]	-1.041	0.524	-1.985	0.047	-2.069	-0.013
species[T.MALLAU]	0.126	0.342	0.368	0.713	-0.545	0.797
species[T.SALAPI]	0.116	0.312	0.371	0.710	-0.495	0.727
species[T.SALLEU]	-0.116	0.327	-0.354	0.724	-0.757	0.526
mpa	0.105	0.067	1.553	0.120	-0.027	0.237
thickness	-0.018	0.159	-0.116	0.908	-0.330	0.293
mpa:thickness	0.074	0.087	0.853	0.394	-0.097	0.246

sample_wt	0.471	0.071	6.592	0.000	0.331	0.611
branching	0.120	0.059	2.017	0.044	0.003	0.236
start_temp	0.176	0.071	2.499	0.012	0.038	0.314
leaf_sav	0.011	0.159	0.072	0.943	-0.301	0.324
Group Var	0.000					
species:plant_id Var	0.103	0.098				

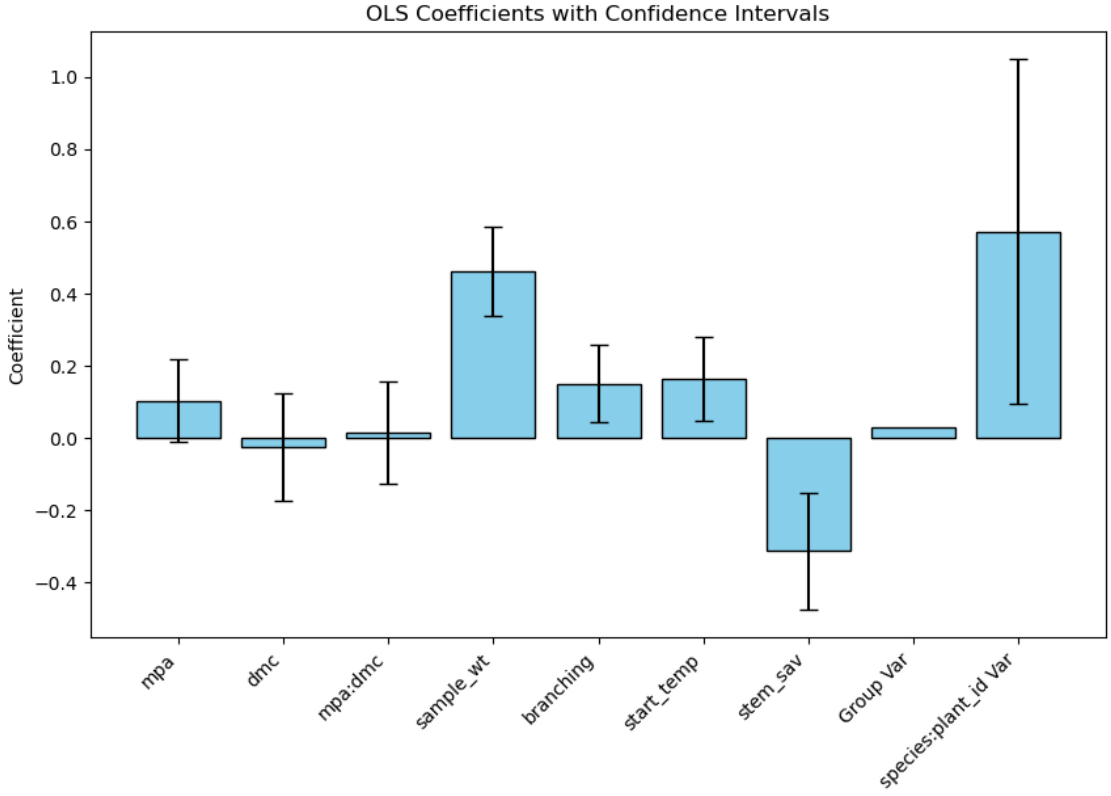


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fh
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.2350
Min. group size:	2	Log-Likelihood:	-138.1301
Max. group size:	37	Converged:	No
Mean group size:	20.2		

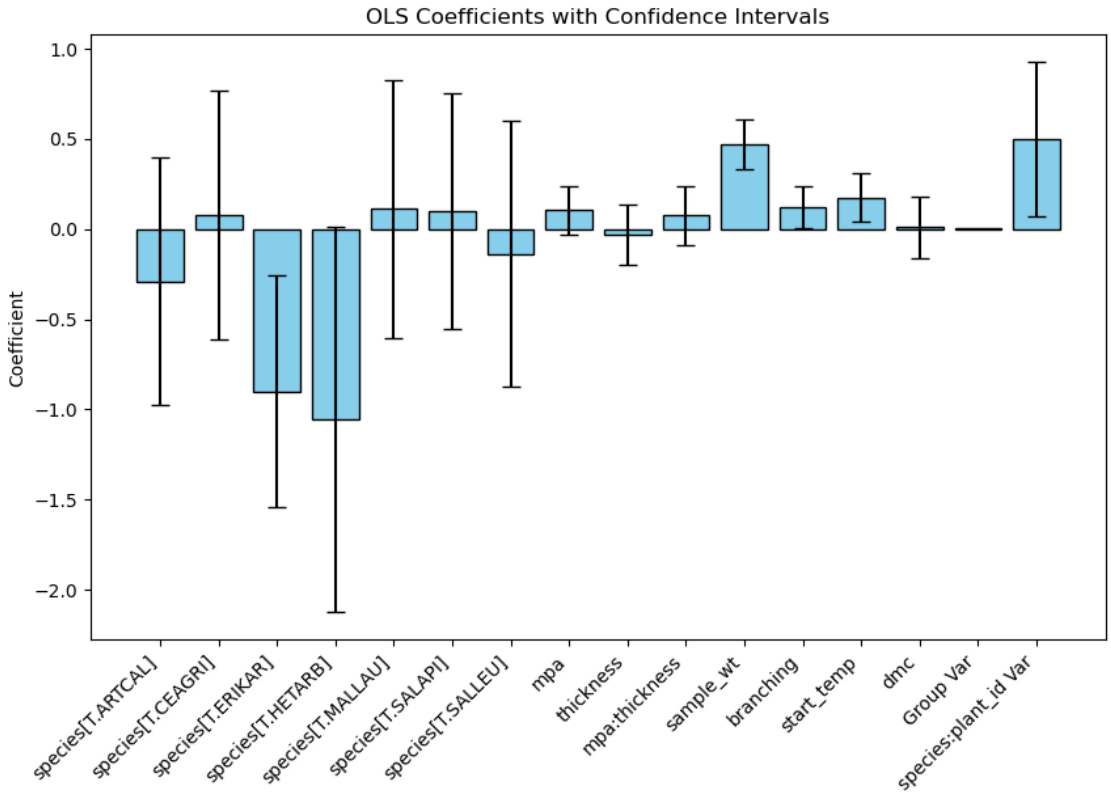
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.012	0.074	0.156	0.876	-0.134	0.157
mpa	0.103	0.058	1.772	0.076	-0.011	0.217

```
dmc                   -0.026    0.076 -0.345 0.730 -0.176  0.123
mpa:dmc                0.015    0.073  0.208 0.835 -0.128  0.158
sample_wt              0.463    0.063  7.355 0.000  0.340  0.586
branching              0.150    0.055  2.729 0.006  0.042  0.257
start_temp             0.163    0.059  2.754 0.006  0.047  0.278
stem_sav              -0.314    0.083 -3.792 0.000 -0.477 -0.152
Group Var              0.007
species:plant_id Var   0.134    0.118
================================================================
```




```
            Mixed Linear Model Regression Results
================================================================
Model:               MixedLM   Dependent Variable:   fh
No. Observations:    162       Method:               ML
No. Groups:          8         Scale:                0.2231
Min. group size:     2         Log-Likelihood:       -131.1509
Max. group size:     37        Converged:            No
Mean group size:     20.2
----------------------------------------------------------------
                    Coef.  Std.Err.   z    P>|z| [0.025 0.975]
----------------------------------------------------------------
```

```
Intercept              0.231    0.288  0.805 0.421 -0.332  0.795
species[T.ARTCAL]     -0.292    0.350 -0.836 0.403 -0.978  0.393
species[T.CEAGRI]      0.078    0.352  0.221 0.825 -0.612  0.767
species[T.ERIKAR]     -0.899    0.329 -2.734 0.006 -1.543 -0.254
species[T.HETARB]     -1.055    0.545 -1.937 0.053 -2.123  0.012
species[T.MALLAU]      0.111    0.364  0.306 0.760 -0.602  0.825
species[T.SALAPI]      0.101    0.333  0.303 0.762 -0.553  0.755
species[T.SALLEU]     -0.137    0.377 -0.364 0.716 -0.875  0.601
mpa                    0.103    0.067  1.531 0.126 -0.029  0.235
thickness             -0.032    0.086 -0.368 0.713 -0.200  0.137
mpa:thickness          0.074    0.085  0.873 0.382 -0.092  0.240
sample_wt              0.467    0.070  6.628 0.000  0.329  0.605
branching              0.121    0.059  2.060 0.039  0.006  0.236
start_temp             0.174    0.069  2.526 0.012  0.039  0.309
dmc                    0.010    0.088  0.109 0.914 -0.164  0.183
Group Var              0.000
species:plant_id Var   0.111    0.103
============================================================
```



5 Flame Duration

[9]:
```
yvar='fd'
cols=cols_use
df=flam
compare_predictors_mixedeff(df, cols, yvar)
```

	cols	aics	pvals	coefs	top_mod
0	species	451.016860	-0.382953	5.361410e-01	True
1	mpa	446.750330	-0.045917	6.229635e-01	False
2	start_temp	446.445675	-0.046927	5.914359e-01	False
3	thickness	445.980840	0.065724	4.658912e-01	False
4	branching	445.895056	0.145043	1.196389e-01	False
5	leaf_sav	445.496714	-0.092000	3.336763e-01	False
6	LMA	444.851697	0.305154	1.408714e-02	False
7	lfm	444.134673	-0.255362	5.476824e-02	False
8	leaf_mass_ratio	443.949117	-0.241753	2.874643e-02	False
9	stem_sav	442.180284	-0.349600	9.230438e-03	False
10	branch_volume	435.619538	0.317514	4.464033e-04	False
11	dmc	435.194484	0.409251	2.901647e-04	False
12	sample_wt	420.165104	0.484080	4.249122e-08	False

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

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

Columns present in sig. interaction terms: {'thickness', 'species',
'start_temp', 'mpa'}

Total Num. Cols : Num. Sig. Int. Cols;  13 : 4

Significant Interactions:
('mpa', 'species')
('start_temp', 'species')
('thickness', 'species')

Number of formulas: 9728
ERROR: Formula model error: fd ~ mpa*species + sample_wt + leaf_mass_ratio +
branch_volume + leaf_sav
ERROR: Formula model error: fd ~ mpa*species + sample_wt + branching +
start_temp + dmc
ERROR: Formula model error: fd ~ mpa*species + lfm + sample_wt + leaf_mass_ratio
+ branching + start_temp + thickness
ERROR: Formula model error: fd ~ mpa*species + lfm + sample_wt + leaf_mass_ratio
+ start_temp + stem_sav + thickness
ERROR: Formula model error: fd ~ mpa*species + lfm + sample_wt + start_temp +
branch_volume + stem_sav + thickness
```

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

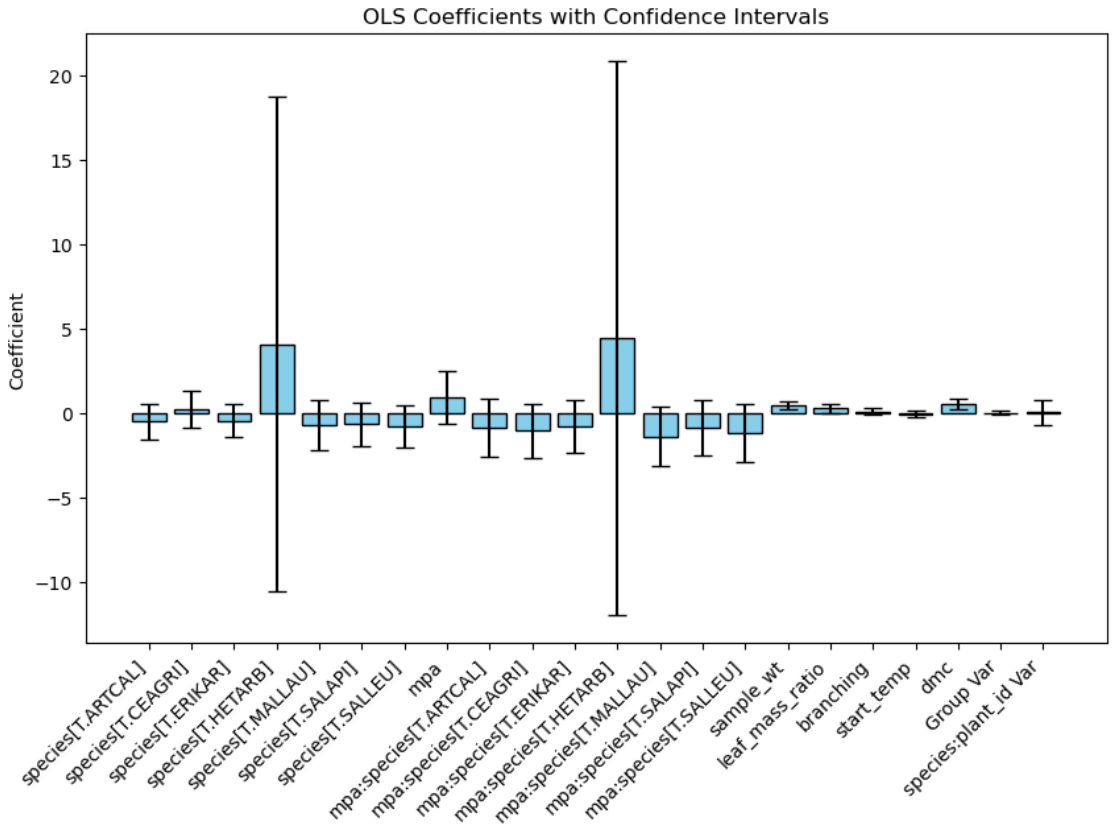

fd ~ mpa*species + sample_wt + leaf_mass_ratio + branching + start_temp + dmc
fd ~ mpa*species + sample_wt + leaf_mass_ratio + branching + dmc + leaf_sav
fd ~ mpa*species + sample_wt + leaf_mass_ratio + dmc + thickness
fd ~ mpa*species + sample_wt + leaf_mass_ratio + branching + dmc + thickness
fd ~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

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

Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.5771
Min. group size:	2	Log-Likelihood:	-187.3920
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.500	0.509	0.983	0.326	-0.497	1.497
species[T.ARTCAL]	-0.517	0.531	-0.974	0.330	-1.557	0.523
species[T.CEAGRI]	0.210	0.545	0.385	0.700	-0.858	1.279
species[T.ERIKAR]	-0.467	0.504	-0.927	0.354	-1.456	0.521
species[T.HETARB]	4.076	7.465	0.546	0.585	-10.555	18.707
species[T.MALLAU]	-0.730	0.761	-0.959	0.337	-2.222	0.762
species[T.SALAPI]	-0.687	0.648	-1.060	0.289	-1.958	0.584
species[T.SALLEU]	-0.840	0.640	-1.313	0.189	-2.095	0.414
mpa	0.937	0.793	1.182	0.237	-0.617	2.490
mpa:species[T.ARTCAL]	-0.893	0.863	-1.035	0.301	-2.583	0.798
mpa:species[T.CEAGRI]	-1.069	0.819	-1.306	0.192	-2.675	0.536
mpa:species[T.ERIKAR]	-0.840	0.800	-1.051	0.293	-2.408	0.727
mpa:species[T.HETARB]	4.397	8.378	0.525	0.600	-12.023	20.816
mpa:species[T.MALLAU]	-1.408	0.899	-1.566	0.117	-3.170	0.354
mpa:species[T.SALAPI]	-0.872	0.850	-1.025	0.305	-2.538	0.795
mpa:species[T.SALLEU]	-1.204	0.880	-1.369	0.171	-2.928	0.520
sample_wt	0.441	0.125	3.517	0.000	0.195	0.687
leaf_mass_ratio	0.260	0.143	1.813	0.070	-0.021	0.541
branching	0.091	0.098	0.923	0.356	-0.102	0.283
start_temp	-0.067	0.090	-0.739	0.460	-0.244	0.110
dmc	0.520	0.155	3.351	0.001	0.216	0.824
Group Var	0.001	0.041				
species:plant_id Var	0.015	0.283				

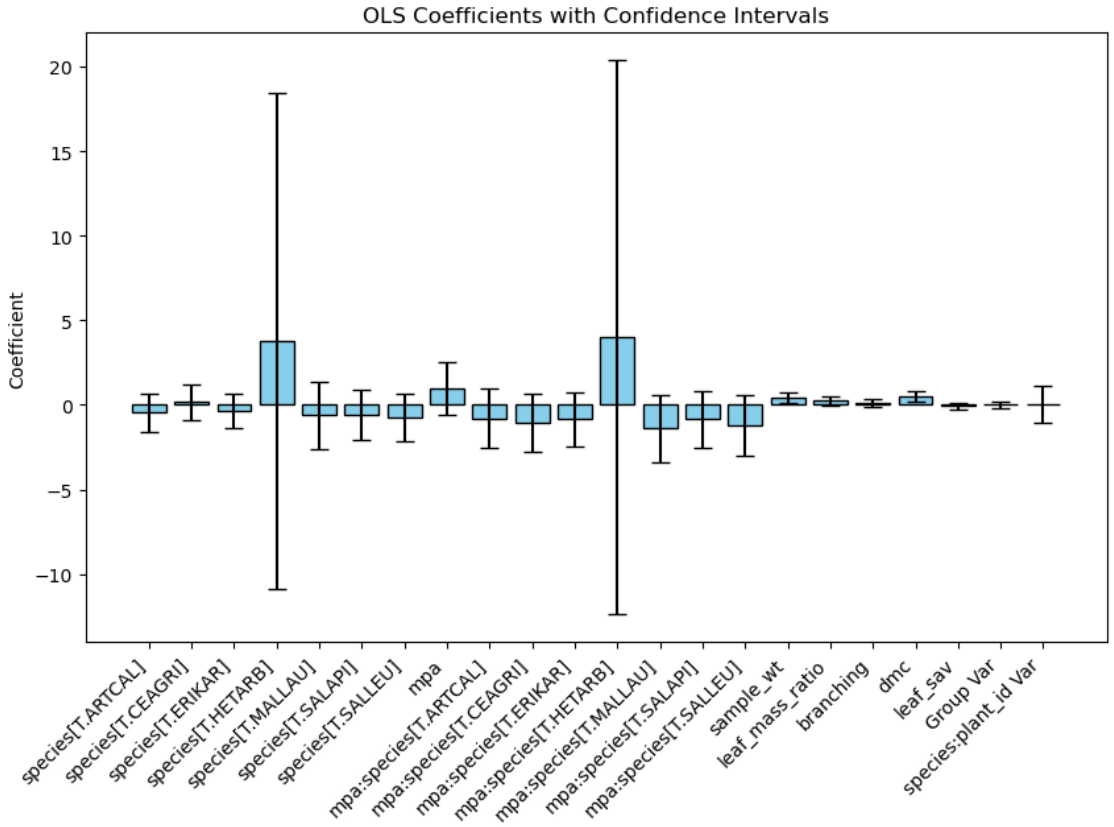


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.5793
Min. group size:	2	Log-Likelihood:	-187.4223
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

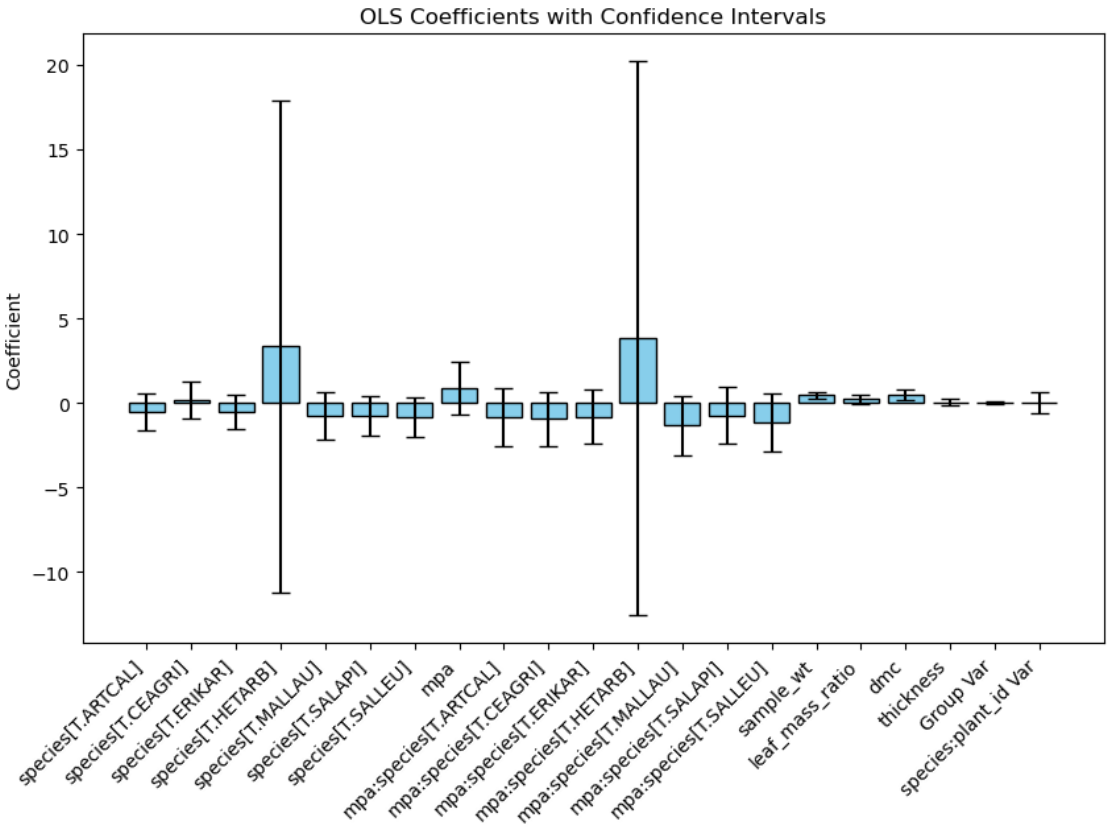
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.440	0.559	0.788	0.431	-0.655	1.535
species[T.ARTCAL]	-0.464	0.585	-0.793	0.428	-1.611	0.683
species[T.CEAGRI]	0.181	0.541	0.334	0.738	-0.879	1.241
species[T.ERIKAR]	-0.377	0.525	-0.718	0.473	-1.406	0.652
species[T.HETARB]	3.786	7.479	0.506	0.613	-10.872	18.444
species[T.MALLAU]	-0.628	1.007	-0.624	0.533	-2.601	1.345
species[T.SALAPI]	-0.624	0.758	-0.823	0.411	-2.109	0.862
species[T.SALLEU]	-0.765	0.718	-1.067	0.286	-2.172	0.641
mpa	0.949	0.803	1.182	0.237	-0.625	2.523
mpa:species[T.ARTCAL]	-0.797	0.897	-0.889	0.374	-2.556	0.961

```
mpa:species[T.CEAGRI] -1.062    0.859 -1.236 0.216  -2.746  0.622
mpa:species[T.ERIKAR] -0.855    0.803 -1.064 0.287  -2.430  0.719
mpa:species[T.HETARB]  3.975    8.359  0.476 0.634 -12.408 20.358
mpa:species[T.MALLAU] -1.401    1.000 -1.401 0.161  -3.362  0.560
mpa:species[T.SALAPI] -0.858    0.872 -0.984 0.325  -2.566  0.851
mpa:species[T.SALLEU] -1.227    0.921 -1.332 0.183  -3.032  0.579
sample_wt              0.436    0.155  2.823 0.005   0.133  0.740
leaf_mass_ratio        0.256    0.143  1.787 0.074  -0.025  0.536
branching              0.095    0.113  0.841 0.400  -0.126  0.316
dmc                    0.517    0.168  3.077 0.002   0.188  0.847
leaf_sav              -0.055    0.095 -0.586 0.558  -0.241  0.130
Group Var              0.000    0.067
species:plant_id Var   0.013    0.433
================================================================
```




```
            Mixed Linear Model Regression Results
================================================================
Model:               MixedLM    Dependent Variable:    fd
No. Observations:    162        Method:                ML
No. Groups:          8          Scale:                 0.5892
```

```
Min. group size:      2          Log-Likelihood:        -188.6050
Max. group size:      37         Converged:             No
Mean group size:      20.2
-----------------------------------------------------------------
                      Coef.  Std.Err.   z    P>|z|  [0.025 0.975]
-----------------------------------------------------------------
Intercept              0.522    0.503  1.037 0.300  -0.465  1.508
species[T.ARTCAL]     -0.528    0.557 -0.948 0.343  -1.619  0.564
species[T.CEAGRI]      0.150    0.554  0.271 0.786  -0.935  1.236
species[T.ERIKAR]     -0.505    0.522 -0.968 0.333  -1.528  0.517
species[T.HETARB]      3.363    7.428  0.453 0.651 -11.196 17.922
species[T.MALLAU]     -0.757    0.704 -1.075 0.282  -2.137  0.623
species[T.SALAPI]     -0.735    0.602 -1.222 0.222  -1.914  0.444
species[T.SALLEU]     -0.825    0.591 -1.396 0.163  -1.983  0.334
mpa                    0.878    0.795  1.104 0.270  -0.680  2.436
mpa:species[T.ARTCAL] -0.832    0.870 -0.957 0.339  -2.537  0.873
mpa:species[T.CEAGRI] -0.950    0.825 -1.152 0.249  -2.566  0.667
mpa:species[T.ERIKAR] -0.797    0.801 -0.994 0.320  -2.368  0.774
mpa:species[T.HETARB]  3.812    8.360  0.456 0.648 -12.574 20.197
mpa:species[T.MALLAU] -1.317    0.900 -1.463 0.143  -3.080  0.447
mpa:species[T.SALAPI] -0.728    0.855 -0.851 0.395  -2.402  0.947
mpa:species[T.SALLEU] -1.144    0.863 -1.325 0.185  -2.835  0.548
sample_wt              0.468    0.111  4.219 0.000   0.250  0.685
leaf_mass_ratio        0.233    0.138  1.695 0.090  -0.036  0.503
dmc                    0.504    0.146  3.459 0.001   0.218  0.789
thickness              0.048    0.094  0.509 0.611  -0.136  0.232
Group Var              0.006    0.034
species:plant_id Var   0.006    0.246
=================================================================
```

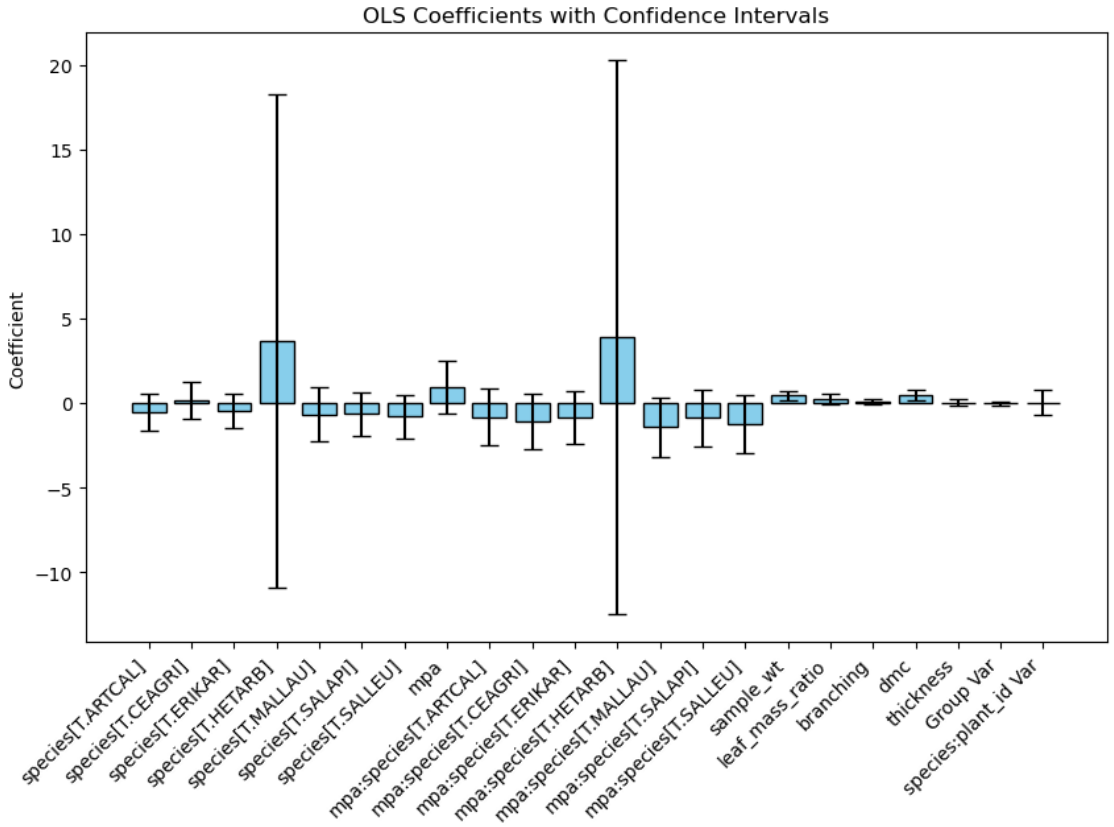


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.5774
Min. group size:	2	Log-Likelihood:	-187.6344
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

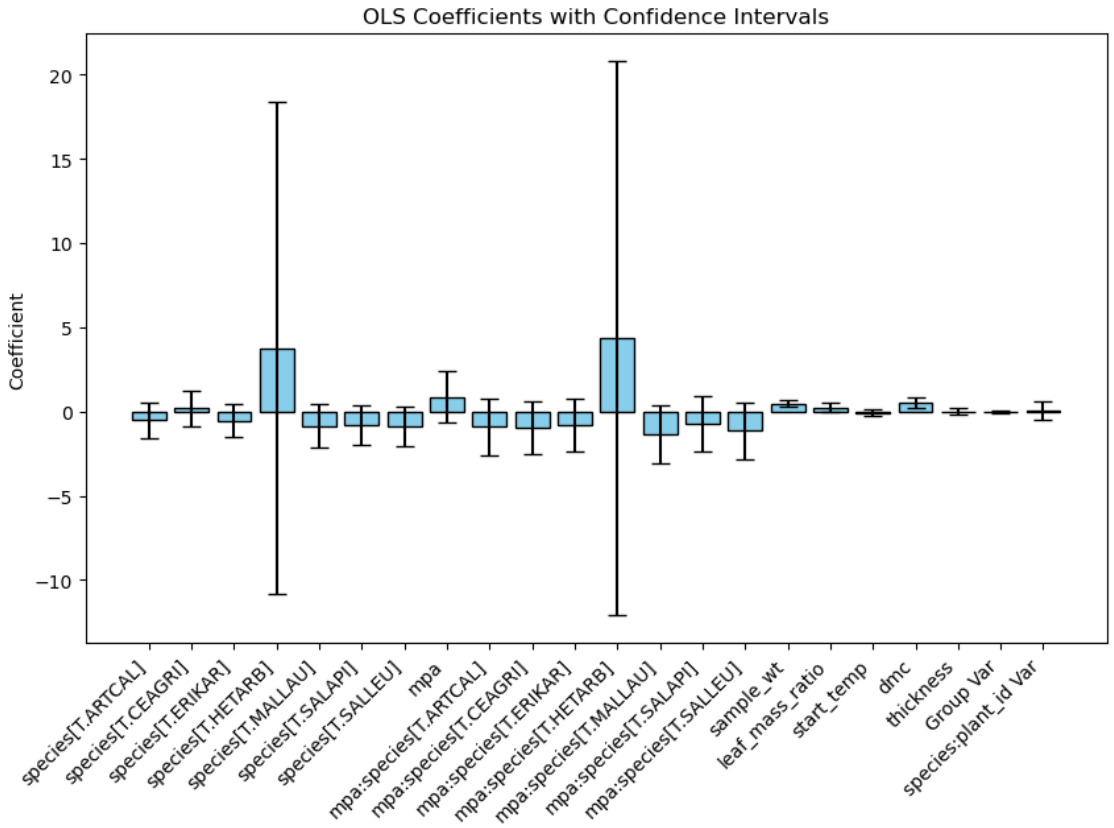
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.472	0.527	0.896	0.370	-0.560	1.504
species[T.ARTCAL]	-0.528	0.557	-0.948	0.343	-1.621	0.564
species[T.CEAGRI]	0.168	0.544	0.309	0.758	-0.898	1.234
species[T.ERIKAR]	-0.431	0.518	-0.831	0.406	-1.447	0.585
species[T.HETARB]	3.660	7.443	0.492	0.623	-10.928	18.248
species[T.MALLAU]	-0.660	0.813	-0.812	0.417	-2.254	0.934
species[T.SALAPI]	-0.640	0.656	-0.976	0.329	-1.926	0.646
species[T.SALLEU]	-0.791	0.648	-1.221	0.222	-2.060	0.479
mpa	0.952	0.790	1.205	0.228	-0.596	2.501
mpa:species[T.ARTCAL]	-0.825	0.864	-0.955	0.340	-2.519	0.869

```
mpa:species[T.CEAGRI] -1.068    0.823 -1.298 0.194  -2.681  0.545
mpa:species[T.ERIKAR] -0.859    0.799 -1.075 0.282  -2.424  0.707
mpa:species[T.HETARB]  3.871    8.352  0.464 0.643 -12.498 20.240
mpa:species[T.MALLAU] -1.413    0.897 -1.574 0.115  -3.171  0.346
mpa:species[T.SALAPI] -0.862    0.849 -1.015 0.310  -2.526  0.802
mpa:species[T.SALLEU] -1.210    0.872 -1.388 0.165  -2.919  0.498
sample_wt              0.443    0.124  3.562 0.000   0.199  0.687
leaf_mass_ratio        0.247    0.141  1.753 0.080  -0.029  0.524
branching              0.091    0.097  0.937 0.349  -0.100  0.282
dmc                    0.508    0.162  3.140 0.002   0.191  0.825
thickness              0.030    0.102  0.290 0.772  -0.170  0.229
Group Var              0.000    0.042
species:plant_id Var   0.017    0.293
================================================================
```




```
              Mixed Linear Model Regression Results
================================================================
Model:                MixedLM    Dependent Variable:    fd
No. Observations:     162        Method:                ML
No. Groups:           8          Scale:                 0.5808
```

```
Min. group size:      2          Log-Likelihood:        -187.7955
Max. group size:      37         Converged:             Yes
Mean group size:      20.2
-----------------------------------------------------------------
                      Coef.  Std.Err.   z    P>|z|  [0.025 0.975]
-----------------------------------------------------------------
Intercept              0.556    0.496  1.120 0.263  -0.417  1.529
species[T.ARTCAL]     -0.521    0.542 -0.961 0.337  -1.584  0.542
species[T.CEAGRI]      0.196    0.546  0.358 0.720  -0.875  1.267
species[T.ERIKAR]     -0.541    0.513 -1.054 0.292  -1.547  0.465
species[T.HETARB]      3.768    7.452  0.506 0.613 -10.838 18.373
species[T.MALLAU]     -0.849    0.670 -1.268 0.205  -2.162  0.463
species[T.SALAPI]     -0.794    0.586 -1.355 0.175  -1.942  0.354
species[T.SALLEU]     -0.884    0.585 -1.513 0.130  -2.030  0.261
mpa                    0.870    0.791  1.100 0.271  -0.680  2.420
mpa:species[T.ARTCAL] -0.909    0.865 -1.050 0.294  -2.605  0.788
mpa:species[T.CEAGRI] -0.964    0.811 -1.189 0.235  -2.555  0.626
mpa:species[T.ERIKAR] -0.782    0.800 -0.977 0.328  -2.351  0.787
mpa:species[T.HETARB]  4.330    8.394  0.516 0.606 -12.122 20.782
mpa:species[T.MALLAU] -1.333    0.875 -1.525 0.127  -3.047  0.381
mpa:species[T.SALAPI] -0.750    0.845 -0.888 0.375  -2.405  0.905
mpa:species[T.SALLEU] -1.150    0.859 -1.340 0.180  -2.833  0.533
sample_wt              0.467    0.109  4.303 0.000   0.254  0.680
leaf_mass_ratio        0.246    0.141  1.739 0.082  -0.031  0.523
start_temp            -0.068    0.095 -0.721 0.471  -0.254  0.117
dmc                    0.518    0.146  3.547 0.000   0.232  0.804
thickness              0.016    0.102  0.158 0.874  -0.184  0.216
Group Var              0.000    0.029
species:plant_id Var   0.015    0.215
=================================================================
```

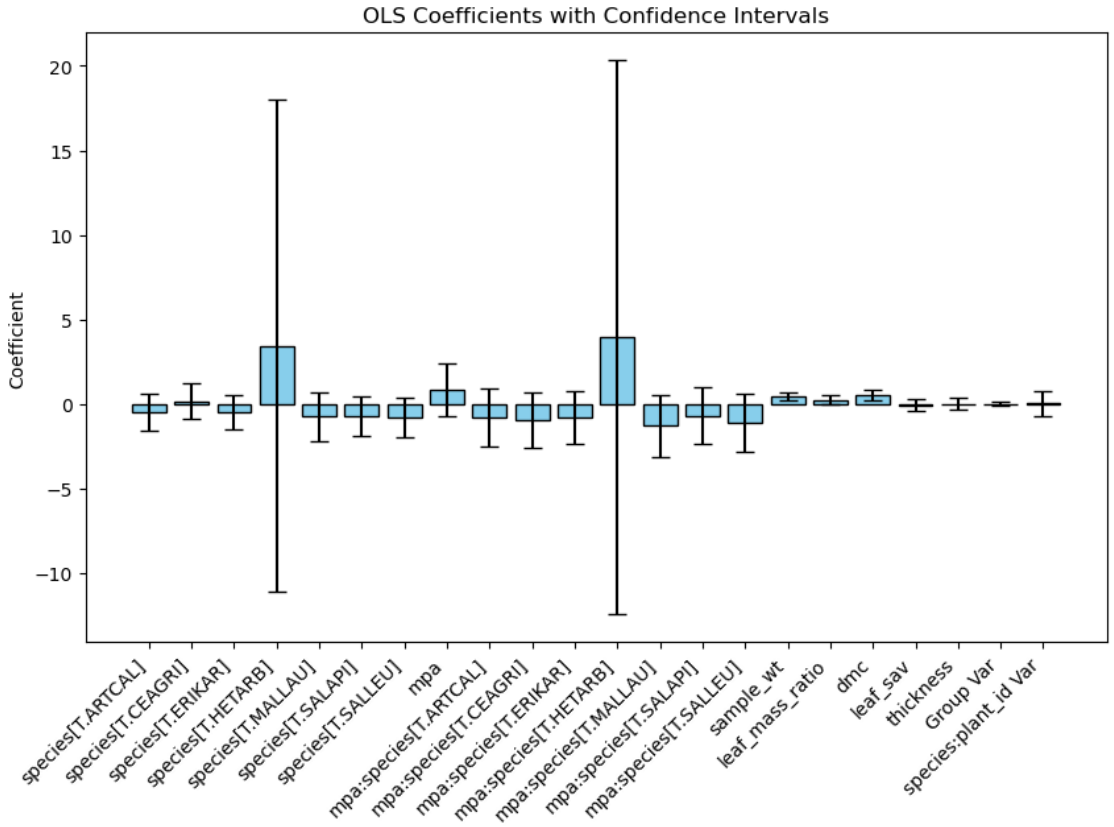


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.5860
Min. group size:	2	Log-Likelihood:	-187.9139
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

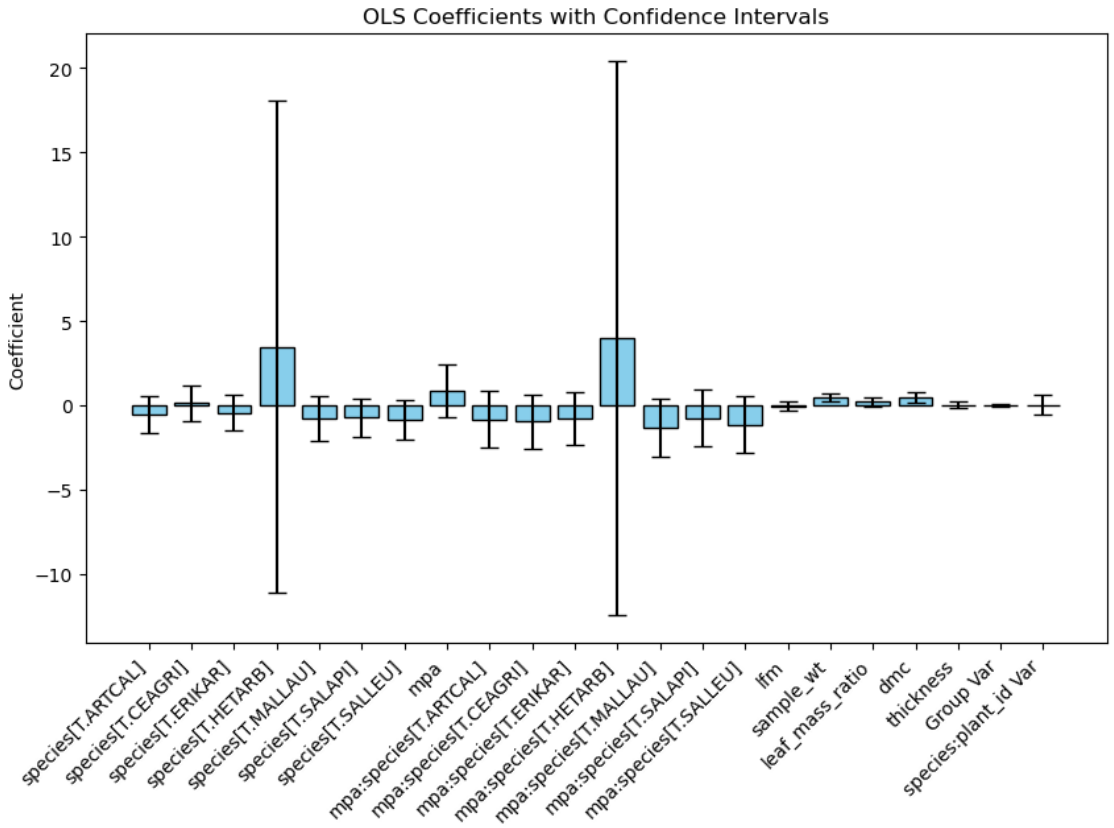
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.509	0.499	1.020	0.308	-0.469	1.487
species[T.ARTCAL]	-0.485	0.556	-0.872	0.383	-1.575	0.605
species[T.CEAGRI]	0.146	0.545	0.268	0.789	-0.921	1.214
species[T.ERIKAR]	-0.472	0.519	-0.909	0.364	-1.489	0.546
species[T.HETARB]	3.443	7.431	0.463	0.643	-11.122	18.009
species[T.MALLAU]	-0.767	0.736	-1.042	0.297	-2.209	0.675
species[T.SALAPI]	-0.733	0.602	-1.217	0.224	-1.913	0.448
species[T.SALLEU]	-0.803	0.589	-1.364	0.172	-1.957	0.350
mpa	0.868	0.797	1.088	0.276	-0.695	2.430
mpa:species[T.ARTCAL]	-0.796	0.878	-0.906	0.365	-2.517	0.925

```
mpa:species[T.CEAGRI] -0.939    0.833 -1.127 0.260  -2.572  0.694
mpa:species[T.ERIKAR] -0.784    0.803 -0.975 0.329  -2.359  0.791
mpa:species[T.HETARB]  3.918    8.364  0.468 0.639 -12.475 20.312
mpa:species[T.MALLAU] -1.308    0.922 -1.420 0.156  -3.115  0.498
mpa:species[T.SALAPI] -0.705    0.860 -0.819 0.413  -2.391  0.982
mpa:species[T.SALLEU] -1.135    0.874 -1.298 0.194  -2.848  0.578
sample_wt              0.463    0.114  4.045 0.000   0.238  0.687
leaf_mass_ratio        0.240    0.139  1.726 0.084  -0.033  0.513
dmc                    0.518    0.155  3.353 0.001   0.215  0.821
leaf_sav              -0.068    0.175 -0.392 0.695  -0.411  0.274
thickness             -0.010    0.187 -0.055 0.956  -0.377  0.356
Group Var              0.001    0.043
species:plant_id Var   0.009    0.287
================================================================
```




```
              Mixed Linear Model Regression Results
================================================================
Model:                MixedLM    Dependent Variable:    fd
No. Observations:     162        Method:                ML
No. Groups:           8          Scale:                 0.5843
```

```
Min. group size:      2          Log-Likelihood:        -187.9389
Max. group size:      37         Converged:             No
Mean group size:      20.2
-----------------------------------------------------------------
                      Coef.  Std.Err.   z    P>|z|  [0.025 0.975]
-----------------------------------------------------------------
Intercept              0.519    0.497  1.043 0.297  -0.456  1.493
species[T.ARTCAL]     -0.566    0.554 -1.020 0.308  -1.652  0.521
species[T.CEAGRI]      0.133    0.546  0.243 0.808  -0.938  1.203
species[T.ERIKAR]     -0.439    0.547 -0.802 0.422  -1.511  0.633
species[T.HETARB]      3.485    7.442  0.468 0.640 -11.102 18.071
species[T.MALLAU]     -0.772    0.681 -1.135 0.257  -2.106  0.562
species[T.SALAPI]     -0.722    0.590 -1.225 0.220  -1.878  0.433
species[T.SALLEU]     -0.843    0.584 -1.444 0.149  -1.987  0.301
mpa                    0.879    0.792  1.109 0.267  -0.674  2.432
mpa:species[T.ARTCAL] -0.831    0.867 -0.959 0.338  -2.531  0.868
mpa:species[T.CEAGRI] -0.963    0.818 -1.176 0.239  -2.566  0.641
mpa:species[T.ERIKAR] -0.789    0.801 -0.985 0.325  -2.359  0.781
mpa:species[T.HETARB]  3.960    8.378  0.473 0.636 -12.461 20.381
mpa:species[T.MALLAU] -1.335    0.884 -1.509 0.131  -3.068  0.399
mpa:species[T.SALAPI] -0.740    0.848 -0.873 0.383  -2.401  0.922
mpa:species[T.SALLEU] -1.143    0.861 -1.328 0.184  -2.830  0.544
lfm                   -0.048    0.143 -0.338 0.735  -0.329  0.232
sample_wt              0.468    0.109  4.297 0.000   0.255  0.681
leaf_mass_ratio        0.225    0.141  1.599 0.110  -0.051  0.502
dmc                    0.486    0.157  3.092 0.002   0.178  0.794
thickness              0.047    0.095  0.489 0.625  -0.140  0.233
Group Var              0.000    0.033
species:plant_id Var   0.012    0.233
=================================================================
```

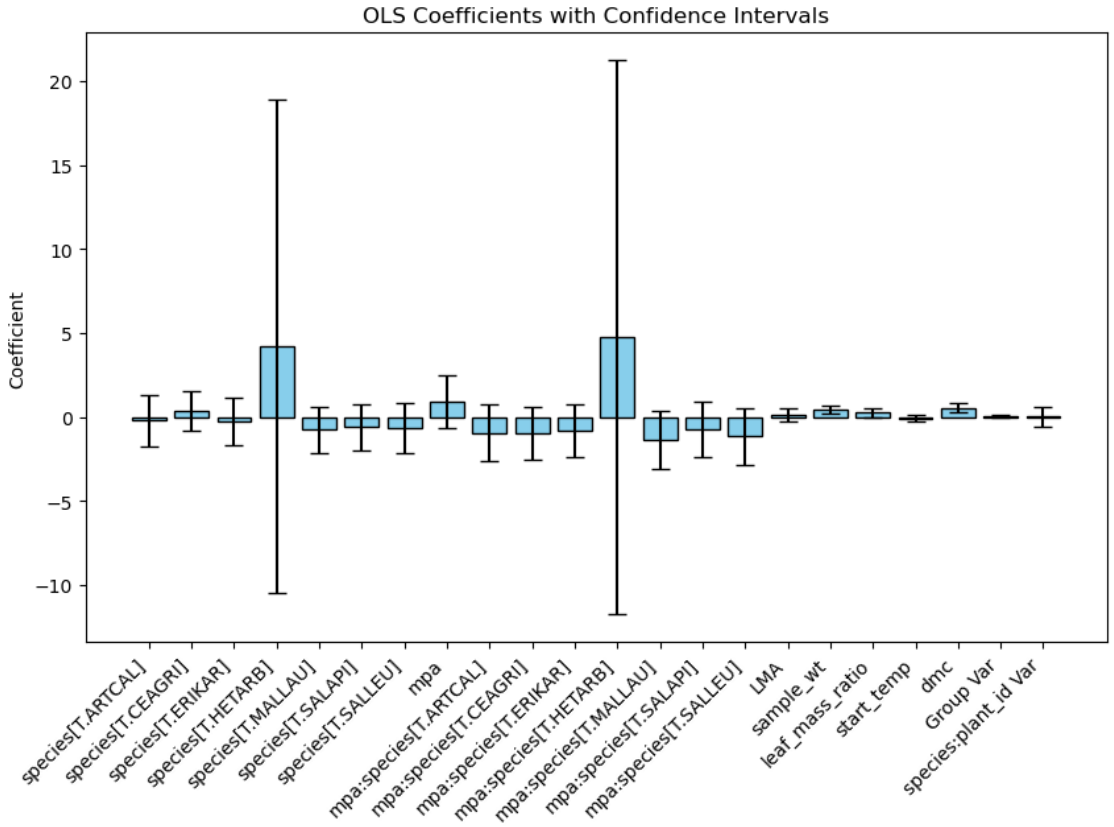


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.5829
Min. group size:	2	Log-Likelihood:	-187.9826
Max. group size:	37	Converged:	No
Mean group size:	20.2		

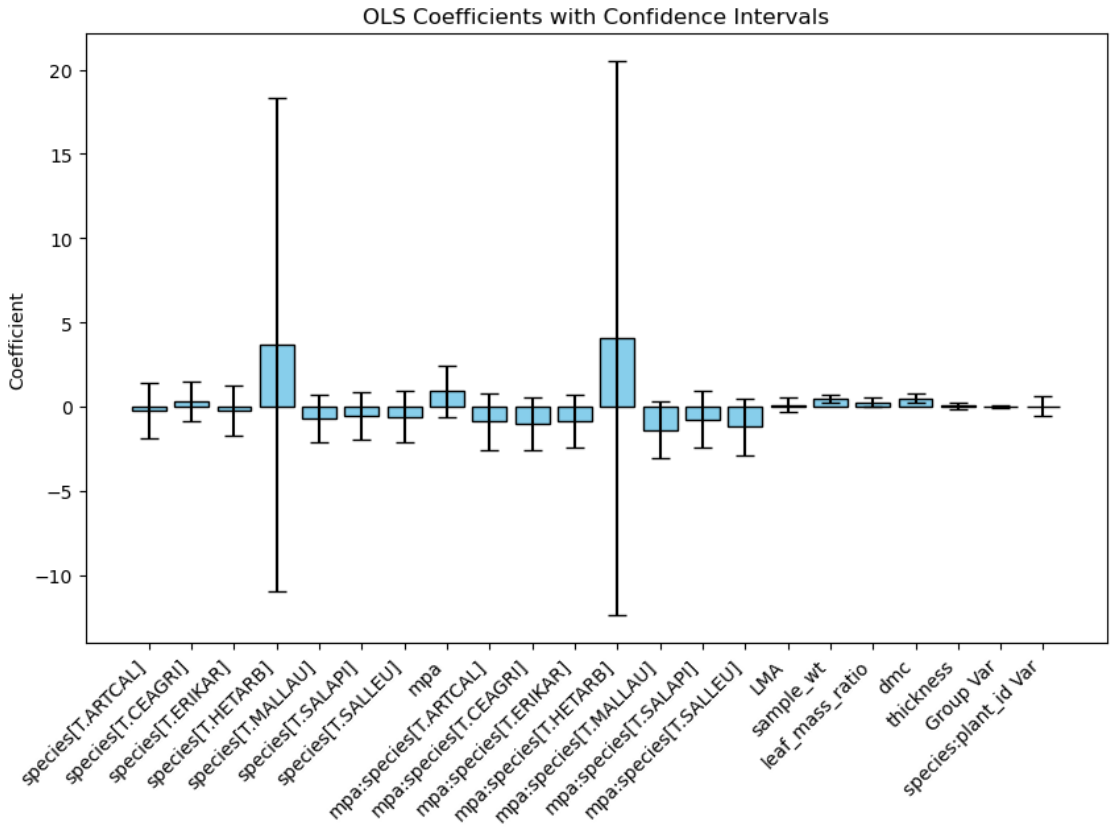
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.382	0.605	0.632	0.528	-0.803	1.568
species[T.ARTCAL]	-0.226	0.785	-0.288	0.773	-1.765	1.312
species[T.CEAGRI]	0.326	0.605	0.539	0.590	-0.859	1.511
species[T.ERIKAR]	-0.280	0.713	-0.392	0.695	-1.676	1.117
species[T.HETARB]	4.203	7.499	0.560	0.575	-10.494	18.900
species[T.MALLAU]	-0.783	0.687	-1.140	0.254	-2.128	0.563
species[T.SALAPI]	-0.612	0.705	-0.868	0.385	-1.994	0.770
species[T.SALLEU]	-0.640	0.767	-0.834	0.404	-2.144	0.864
mpa	0.890	0.792	1.124	0.261	-0.662	2.442
mpa:species[T.ARTCAL]	-0.952	0.865	-1.100	0.271	-2.647	0.744

```
mpa:species[T.CEAGRI] -0.994    0.812 -1.224 0.221  -2.586  0.597
mpa:species[T.ERIKAR] -0.801    0.801 -1.000 0.317  -2.370  0.769
mpa:species[T.HETARB]  4.716    8.416  0.560 0.575 -11.779 21.212
mpa:species[T.MALLAU] -1.372    0.880 -1.558 0.119  -3.098  0.354
mpa:species[T.SALAPI] -0.733    0.852 -0.861 0.389  -2.403  0.936
mpa:species[T.SALLEU] -1.157    0.866 -1.337 0.181  -2.854  0.539
LMA                    0.115    0.210  0.549 0.583  -0.296  0.526
sample_wt              0.454    0.116  3.921 0.000   0.227  0.682
leaf_mass_ratio        0.256    0.142  1.802 0.071  -0.022  0.534
start_temp            -0.083    0.092 -0.907 0.365  -0.264  0.097
dmc                    0.521    0.145  3.605 0.000   0.238  0.805
Group Var              0.004    0.031
species:plant_id Var   0.010    0.231
================================================================
```




```
              Mixed Linear Model Regression Results
================================================================
Model:                MixedLM    Dependent Variable:    fd
No. Observations:     162        Method:                ML
No. Groups:           8          Scale:                 0.5802
```

```
Min. group size:      2          Log-Likelihood:        -188.0158
Max. group size:      37         Converged:             Yes
Mean group size:      20.2
-----------------------------------------------------------------
                     Coef.  Std.Err.   z    P>|z|  [0.025 0.975]
-----------------------------------------------------------------
Intercept             0.344    0.634  0.543 0.587  -0.899  1.587
species[T.ARTCAL]    -0.233    0.834 -0.279 0.780  -1.868  1.402
species[T.CEAGRI]     0.283    0.602  0.470 0.639  -0.897  1.462
species[T.ERIKAR]    -0.226    0.759 -0.299 0.765  -1.714  1.261
species[T.HETARB]     3.686    7.479  0.493 0.622 -10.971 18.344
species[T.MALLAU]    -0.685    0.730 -0.938 0.348  -2.116  0.746
species[T.SALAPI]    -0.568    0.716 -0.793 0.428  -1.971  0.836
species[T.SALLEU]    -0.599    0.774 -0.774 0.439  -2.117  0.919
mpa                   0.917    0.788  1.164 0.244  -0.627  2.462
mpa:species[T.ARTCAL] -0.875    0.863 -1.014 0.311  -2.567  0.817
mpa:species[T.CEAGRI] -1.000    0.811 -1.233 0.218  -2.589  0.589
mpa:species[T.ERIKAR] -0.830    0.800 -1.038 0.299  -2.398  0.738
mpa:species[T.HETARB]  4.038    8.388  0.481 0.630 -12.403 20.478
mpa:species[T.MALLAU] -1.386    0.867 -1.599 0.110  -3.086  0.313
mpa:species[T.SALAPI] -0.742    0.844 -0.879 0.379  -2.397  0.912
mpa:species[T.SALLEU] -1.200    0.856 -1.402 0.161  -2.877  0.477
LMA                   0.107    0.215  0.499 0.618  -0.314  0.529
sample_wt             0.459    0.114  4.013 0.000   0.235  0.684
leaf_mass_ratio       0.242    0.142  1.707 0.088  -0.036  0.519
dmc                   0.506    0.146  3.462 0.001   0.219  0.792
thickness             0.056    0.101  0.554 0.579  -0.142  0.253
Group Var             0.001    0.031
species:plant_id Var  0.016    0.229
=================================================================
```

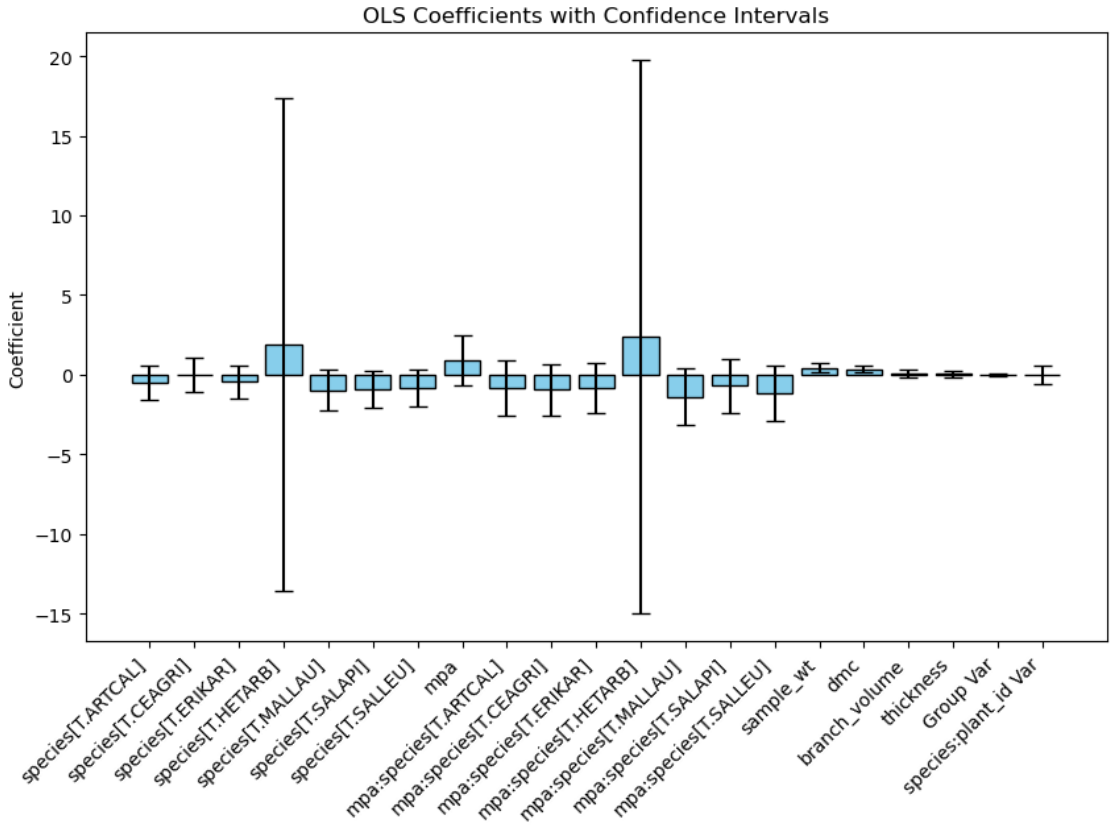


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.6037
Min. group size:	2	Log-Likelihood:	-189.0979
Max. group size:	37	Converged:	No
Mean group size:	20.2		

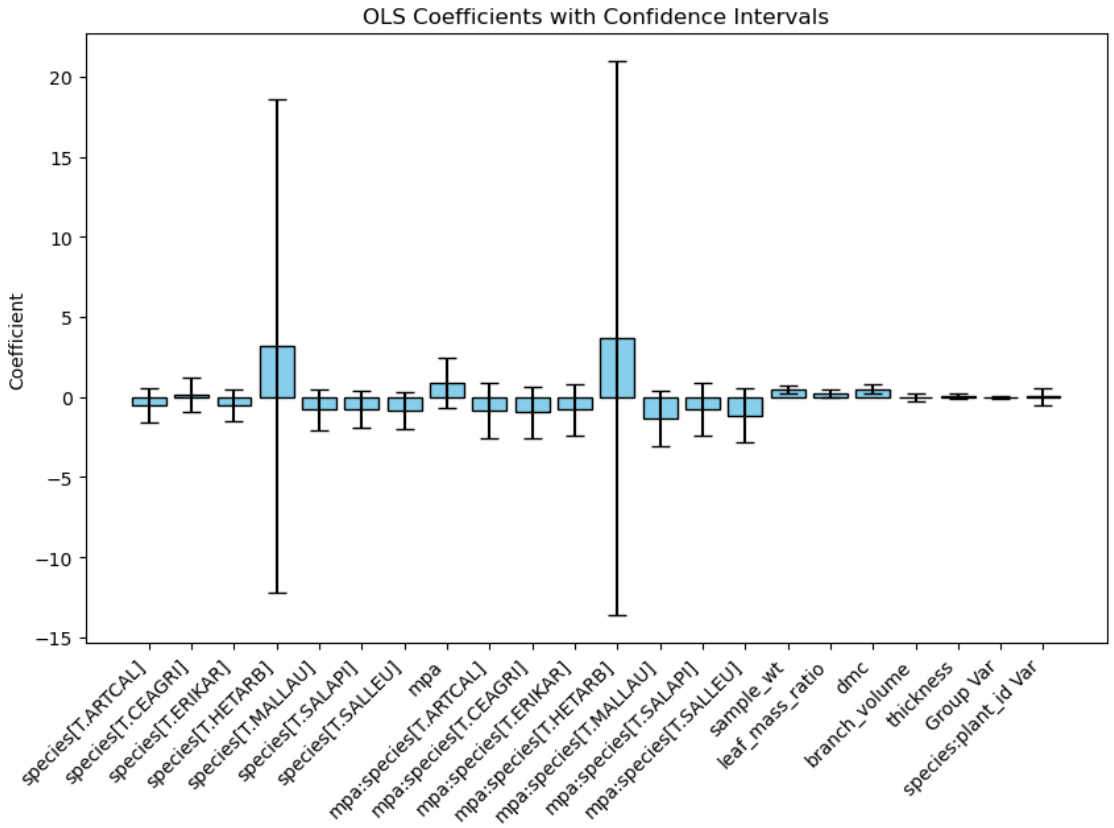
	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.592	0.493	1.201	0.230	-0.374	1.559
species[T.ARTCAL]	-0.525	0.543	-0.968	0.333	-1.589	0.539
species[T.CEAGRI]	-0.000	0.559	-0.000	1.000	-1.096	1.095
species[T.ERIKAR]	-0.448	0.516	-0.868	0.385	-1.459	0.563
species[T.HETARB]	1.909	7.903	0.242	0.809	-13.579	17.398
species[T.MALLAU]	-0.977	0.645	-1.516	0.130	-2.241	0.287
species[T.SALAPI]	-0.919	0.584	-1.574	0.116	-2.063	0.226
species[T.SALLEU]	-0.835	0.572	-1.460	0.144	-1.957	0.286
mpa	0.919	0.801	1.147	0.251	-0.651	2.490
mpa:species[T.ARTCAL]	-0.823	0.880	-0.935	0.350	-2.549	0.902

```
mpa:species[T.CEAGRI] -0.958    0.838 -1.143 0.253  -2.601  0.685
mpa:species[T.ERIKAR] -0.818    0.810 -1.010 0.313  -2.406  0.770
mpa:species[T.HETARB]  2.354    8.866  0.265 0.791 -15.023 19.730
mpa:species[T.MALLAU] -1.378    0.891 -1.547 0.122  -3.125  0.368
mpa:species[T.SALAPI] -0.693    0.871 -0.796 0.426  -2.399  1.014
mpa:species[T.SALLEU] -1.166    0.875 -1.332 0.183  -2.881  0.550
sample_wt              0.434    0.149  2.917 0.004   0.143  0.726
dmc                    0.359    0.120  2.987 0.003   0.123  0.594
branch_volume          0.051    0.129  0.395 0.693  -0.202  0.304
thickness              0.039    0.088  0.442 0.659  -0.133  0.211
Group Var              0.000    0.035
species:plant_id Var   0.001    0.236
================================================================
```




```
              Mixed Linear Model Regression Results
================================================================
Model:                MixedLM    Dependent Variable:    fd
No. Observations:     162        Method:                ML
No. Groups:           8          Scale:                 0.5805
Min. group size:      2          Log-Likelihood:        -188.1082
```

```
Max. group size:      37         Converged:             No
Mean group size:      20.2
-----------------------------------------------------------------
                      Coef.  Std.Err.   z    P>|z|  [0.025 0.975]
-----------------------------------------------------------------
Intercept              0.530    0.496  1.069 0.285  -0.442  1.501
species[T.ARTCAL]     -0.534    0.546 -0.979 0.327  -1.604  0.535
species[T.CEAGRI]      0.149    0.549  0.272 0.786  -0.927  1.225
species[T.ERIKAR]     -0.506    0.512 -0.988 0.323  -1.510  0.498
species[T.HETARB]      3.204    7.868  0.407 0.684 -12.217 18.625
species[T.MALLAU]     -0.788    0.659 -1.195 0.232  -2.079  0.504
species[T.SALAPI]     -0.749    0.581 -1.288 0.198  -1.888  0.390
species[T.SALLEU]     -0.834    0.583 -1.432 0.152  -1.976  0.307
mpa                    0.886    0.789  1.123 0.261  -0.660  2.432
mpa:species[T.ARTCAL] -0.841    0.864 -0.973 0.330  -2.535  0.853
mpa:species[T.CEAGRI] -0.963    0.813 -1.185 0.236  -2.556  0.629
mpa:species[T.ERIKAR] -0.800    0.800 -1.000 0.317  -2.368  0.768
mpa:species[T.HETARB]  3.647    8.822  0.413 0.679 -13.644 20.938
mpa:species[T.MALLAU] -1.342    0.865 -1.552 0.121  -3.038  0.353
mpa:species[T.SALAPI] -0.741    0.843 -0.878 0.380  -2.393  0.912
mpa:species[T.SALLEU] -1.156    0.857 -1.349 0.177  -2.835  0.524
sample_wt              0.466    0.142  3.294 0.001   0.189  0.744
leaf_mass_ratio        0.231    0.143  1.616 0.106  -0.049  0.512
dmc                    0.504    0.151  3.345 0.001   0.209  0.800
branch_volume          0.006    0.125  0.050 0.960  -0.239  0.252
thickness              0.046    0.096  0.479 0.632  -0.142  0.234
Group Var              0.000    0.028
species:plant_id Var   0.017    0.213
=================================================================
```

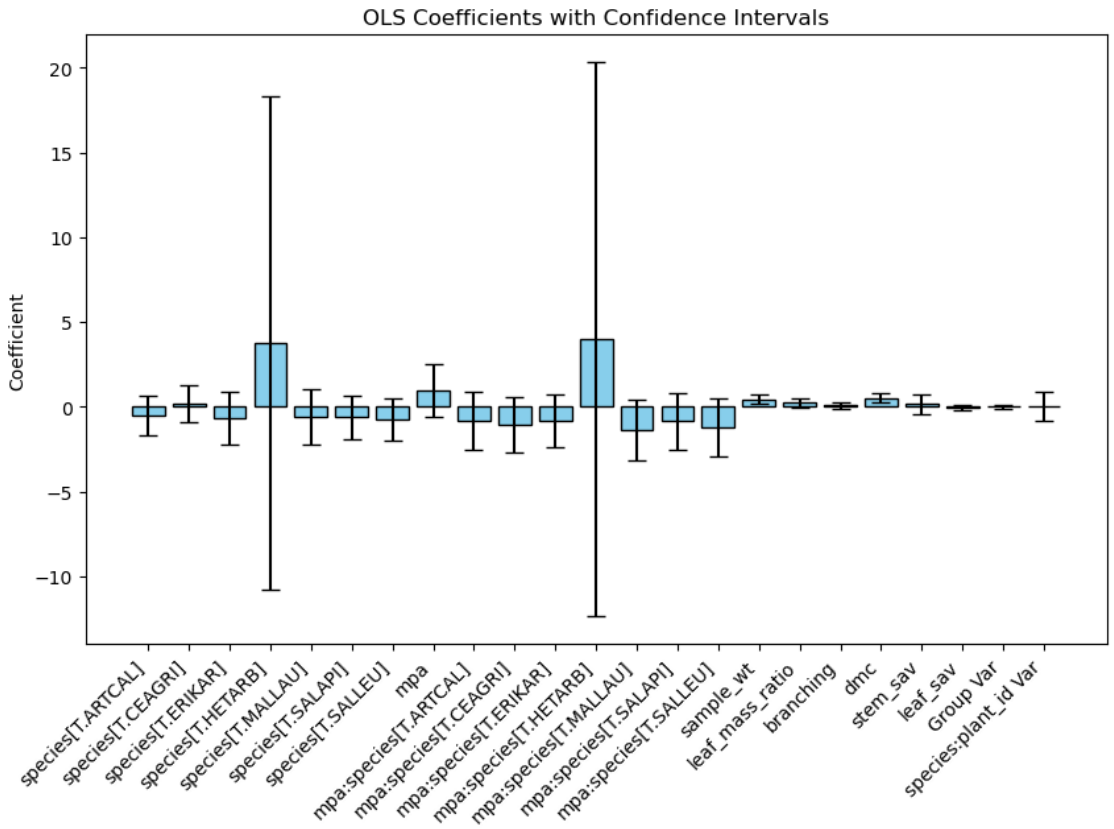


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	fd
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.5781
Min. group size:	2	Log-Likelihood:	-187.2890
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.510	0.557	0.916	0.360	-0.582	1.602
species[T.ARTCAL]	-0.552	0.600	-0.919	0.358	-1.728	0.625
species[T.CEAGRI]	0.185	0.541	0.342	0.732	-0.875	1.245
species[T.ERIKAR]	-0.674	0.798	-0.844	0.398	-2.237	0.890
species[T.HETARB]	3.759	7.440	0.505	0.613	-10.822	18.341
species[T.MALLAU]	-0.621	0.828	-0.750	0.453	-2.245	1.002
species[T.SALAPI]	-0.615	0.662	-0.929	0.353	-1.913	0.682
species[T.SALLEU]	-0.773	0.644	-1.201	0.230	-2.035	0.488
mpa	0.931	0.794	1.173	0.241	-0.625	2.487
mpa:species[T.ARTCAL]	-0.834	0.878	-0.950	0.342	-2.556	0.887

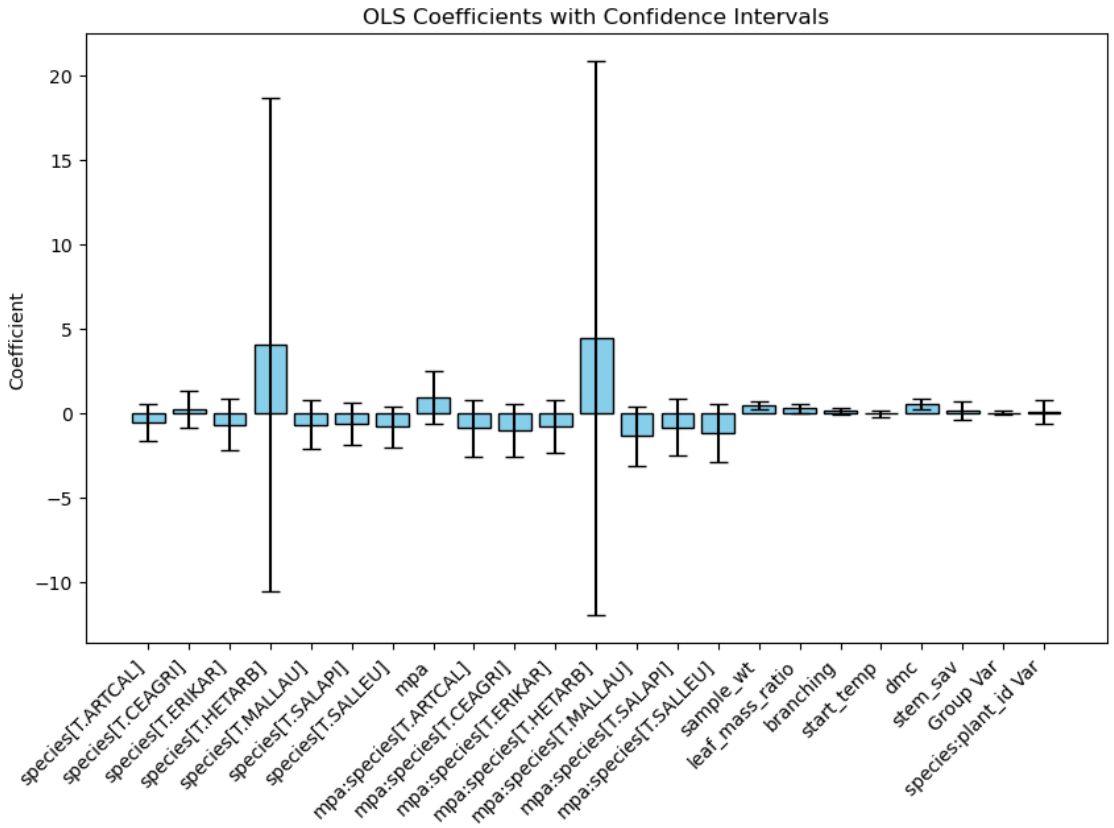
```
mpa:species[T.CEAGRI] -1.041    0.832 -1.251 0.211  -2.672  0.590
mpa:species[T.ERIKAR] -0.824    0.802 -1.027 0.304  -2.396  0.748
mpa:species[T.HETARB]  3.956    8.342  0.474 0.635 -12.394 20.306
mpa:species[T.MALLAU] -1.385    0.923 -1.501 0.133  -3.193  0.423
mpa:species[T.SALAPI] -0.849    0.855 -0.994 0.320  -2.524  0.826
mpa:species[T.SALLEU] -1.212    0.883 -1.373 0.170  -2.942  0.518
sample_wt              0.440    0.135  3.265 0.001   0.176  0.704
leaf_mass_ratio        0.247    0.143  1.725 0.085  -0.034  0.528
branching              0.084    0.105  0.805 0.421  -0.121  0.289
dmc                    0.527    0.158  3.329 0.001   0.217  0.837
stem_sav               0.144    0.288  0.499 0.618  -0.420  0.708
leaf_sav              -0.064    0.092 -0.697 0.486  -0.244  0.116
Group Var              0.000    0.048
species:plant_id Var   0.013    0.325
================================================================
```




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

No. Groups:	8	Scale:	0.5765
Min. group size:	2	Log-Likelihood:	-187.2948
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.563	0.534	1.055	0.291	-0.483	1.610
species[T.ARTCAL]	-0.600	0.568	-1.058	0.290	-1.713	0.512
species[T.CEAGRI]	0.210	0.545	0.386	0.700	-0.858	1.278
species[T.ERIKAR]	-0.720	0.780	-0.924	0.355	-2.248	0.807
species[T.HETARB]	4.046	7.457	0.543	0.587	-10.569	18.660
species[T.MALLAU]	-0.731	0.735	-0.995	0.320	-2.171	0.709
species[T.SALAPI]	-0.682	0.631	-1.080	0.280	-1.919	0.555
species[T.SALLEU]	-0.849	0.631	-1.346	0.178	-2.085	0.387
mpa	0.921	0.792	1.163	0.245	-0.631	2.472
mpa:species[T.ARTCAL]	-0.926	0.864	-1.071	0.284	-2.619	0.768
mpa:species[T.CEAGRI]	-1.052	0.817	-1.288	0.198	-2.653	0.549
mpa:species[T.ERIKAR]	-0.814	0.801	-1.016	0.310	-2.384	0.756
mpa:species[T.HETARB]	4.381	8.372	0.523	0.601	-12.028	20.789
mpa:species[T.MALLAU]	-1.394	0.890	-1.567	0.117	-3.138	0.349
mpa:species[T.SALAPI]	-0.863	0.848	-1.017	0.309	-2.525	0.800
mpa:species[T.SALLEU]	-1.184	0.874	-1.354	0.176	-2.898	0.530
sample_wt	0.444	0.123	3.600	0.000	0.202	0.686
leaf_mass_ratio	0.252	0.145	1.743	0.081	-0.031	0.535
branching	0.082	0.099	0.833	0.405	-0.111	0.275
start_temp	-0.068	0.090	-0.756	0.450	-0.245	0.109
dmc	0.527	0.155	3.395	0.001	0.223	0.831
stem_sav	0.117	0.277	0.423	0.672	-0.425	0.659
Group Var	0.001	0.038				
species:plant_id Var	0.014	0.266				



6 Temp Change

[11]:
```
yvar='temp_change'
cols=cols_use
df=flam
compare_predictors_mixedeff(df, cols, yvar)
```

	cols	aics	pvals	coefs	top_mod
0	LMA	304.534939	0.097680	4.176065e-01	True
1	dmc	303.949995	0.089897	2.708376e-01	True
2	branch_volume	303.464900	0.077979	1.971672e-01	True
3	leaf_mass_ratio	302.284645	-0.167626	7.418627e-02	False
4	thickness	302.081699	0.138460	7.364841e-02	False
5	leaf_sav	302.043892	-0.150075	7.109881e-02	False
6	species	301.769198	-0.477024	1.651199e-01	False
7	lfm	301.232764	-0.197459	4.315243e-02	False
8	stem_sav	300.585701	-0.254306	2.181084e-03	False
9	mpa	300.174135	0.140693	2.528577e-02	False
10	sample_wt	296.458956	0.210282	3.440285e-03	False
11	branching	296.043031	0.171873	2.301602e-03	False

```
12       start_temp  272.278944 -0.350094  5.298375e-10    False
```

[12]:
```
AIC_iterator(flam, cols_use, Y_VAR='temp_change',
             minnumsingle=mns, maxnumsingle=mxs, minnumint=mni, maxnumint=mxi)
```

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

Columns present in sig. interaction terms: {'leaf_mass_ratio', 'species', 'LMA'}

Total Num. Cols : Num. Sig. Int. Cols;  13 : 3

Significant Interactions:
('leaf_mass_ratio', 'species')
('LMA', 'species')

Number of formulas: 5120
ERROR: Formula model error: temp_change ~ LMA*species + leaf_mass_ratio
ERROR: Formula model error: temp_change ~ LMA*species + start_temp
ERROR: Formula model error: temp_change ~ LMA*species + branching + start_temp
ERROR: Formula model error: temp_change ~ LMA*species + mpa + dmc
ERROR: Formula model error: temp_change ~ LMA*species + dmc + branch_volume
ERROR: Formula model error: temp_change ~ LMA*species + lfm + sample_wt + dmc
ERROR: Formula model error: temp_change ~ LMA*species + sample_wt +
branch_volume + leaf_sav
ERROR: Formula model error: temp_change ~ LMA*species + branching + leaf_sav +
thickness
ERROR: Formula model error: temp_change ~ LMA*species + mpa + start_temp +
leaf_sav
ERROR: Formula model error: temp_change ~ LMA*species + lfm + dmc +
branch_volume + leaf_sav
ERROR: Formula model error: temp_change ~ LMA*species + sample_wt +
leaf_mass_ratio + mpa + dmc
ERROR: Formula model error: temp_change ~ LMA*species + sample_wt + branching +
mpa + leaf_sav
ERROR: Formula model error: temp_change ~ LMA*species + sample_wt + dmc +
leaf_sav + thickness
ERROR: Formula model error: temp_change ~ LMA*species + leaf_mass_ratio + mpa +
leaf_sav + thickness
ERROR: Formula model error: temp_change ~ LMA*species + leaf_mass_ratio +
start_temp + dmc + leaf_sav
ERROR: Formula model error: temp_change ~ LMA*species + branching + mpa +
start_temp + stem_sav
ERROR: Formula model error: temp_change ~ LMA*species + branching + start_temp +
branch_volume + leaf_sav
ERROR: Formula model error: temp_change ~ LMA*species + branching + dmc +
leaf_sav + thickness
ERROR: Formula model error: temp_change ~ LMA*species + mpa + dmc +
branch_volume + thickness
```

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

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

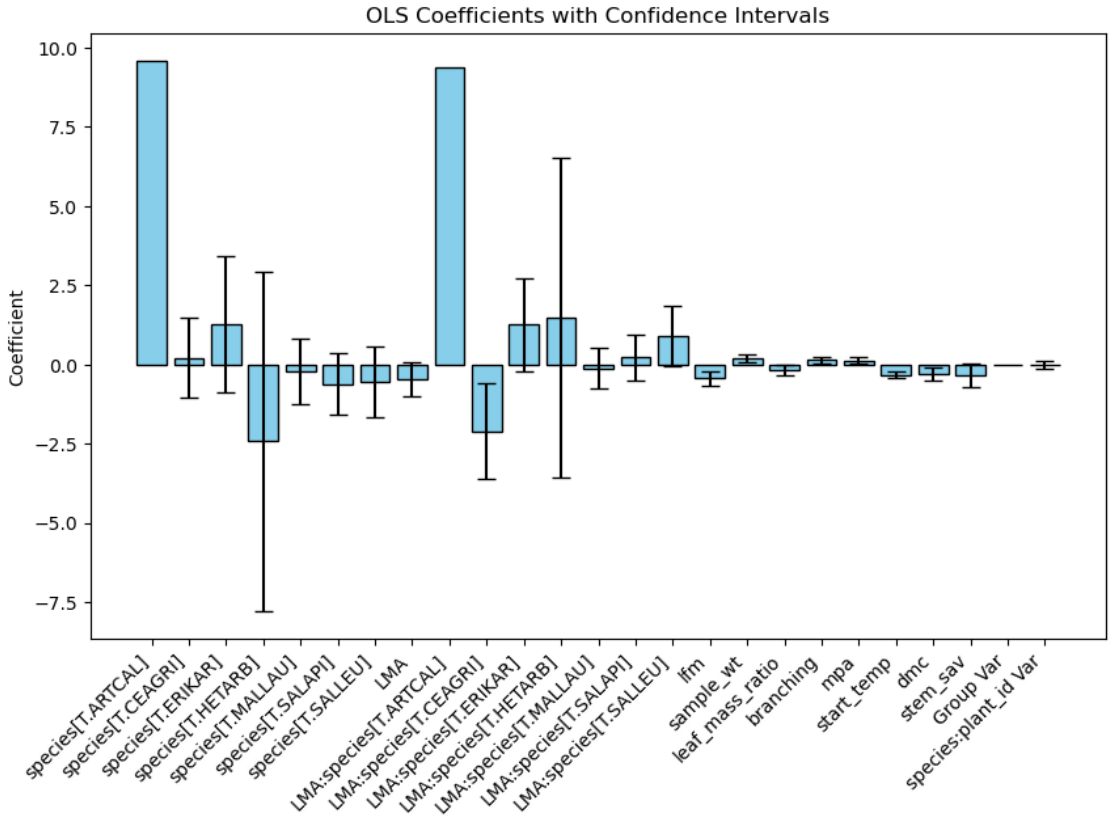
```
ERROR: Formula model error: temp_change ~ LMA*species + lfm + sample_wt + mpa +
branch_volume + stem_sav + leaf_sav + thickness
ERROR: Formula model error: temp_change ~ LMA*species + lfm + sample_wt + dmc +
branch_volume + stem_sav + leaf_sav + thickness
ERROR: Formula model error: temp_change ~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

```
+ start_temp + stem_sav


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


            Mixed Linear Model Regression Results
=============================================================
Model:               MixedLM   Dependent Variable:   temp_change
No. Observations:    162       Method:               ML
No. Groups:          8         Scale:                0.2143
Min. group size:     2         Log-Likelihood:       -105.1361
Max. group size:     37        Converged:            Yes
Mean group size:     20.2
-------------------------------------------------------------
                      Coef.  Std.Err.   z    P>|z| [0.025 0.975]
-------------------------------------------------------------
Intercept              0.544    0.481  1.131 0.258 -0.398  1.486
species[T.ARTCAL]      9.593
species[T.CEAGRI]      0.204    0.648  0.315 0.753 -1.067  1.474
species[T.ERIKAR]      1.278    1.099  1.163 0.245 -0.876  3.433
species[T.HETARB]     -2.431    2.732 -0.890 0.374 -7.787  2.924
species[T.MALLAU]     -0.205    0.527 -0.389 0.697 -1.238  0.828
species[T.SALAPI]     -0.618    0.501 -1.233 0.217 -1.601  0.364
species[T.SALLEU]     -0.544    0.567 -0.959 0.338 -1.655  0.568
LMA                   -0.464    0.269 -1.722 0.085 -0.991  0.064
LMA:species[T.ARTCAL]  9.375
LMA:species[T.CEAGRI] -2.116    0.773 -2.736 0.006 -3.632 -0.600
LMA:species[T.ERIKAR]  1.260    0.752  1.677 0.094 -0.213  2.733
LMA:species[T.HETARB]  1.463    2.577  0.568 0.570 -3.588  6.514
LMA:species[T.MALLAU] -0.117    0.334 -0.352 0.725 -0.771  0.537
LMA:species[T.SALAPI]  0.220    0.362  0.607 0.544 -0.490  0.929
LMA:species[T.SALLEU]  0.904    0.484  1.869 0.062 -0.044  1.852
```

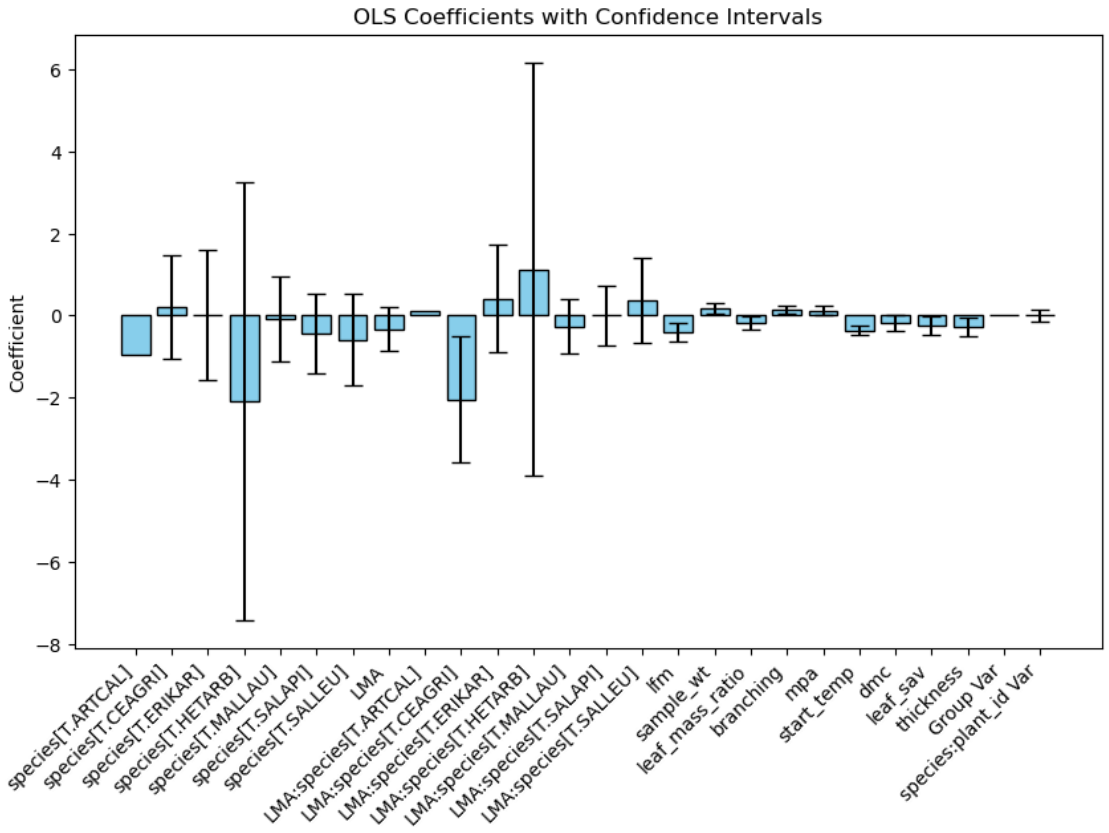
lfm	-0.445	0.119	-3.745	0.000	-0.678	-0.212
sample_wt	0.201	0.064	3.135	0.002	0.075	0.327
leaf_mass_ratio	-0.183	0.087	-2.112	0.035	-0.354	-0.013
branching	0.134	0.054	2.466	0.014	0.027	0.240
mpa	0.123	0.054	2.292	0.022	0.018	0.228
start_temp	-0.334	0.050	-6.656	0.000	-0.432	-0.235
dmc	-0.306	0.105	-2.913	0.004	-0.512	-0.100
stem_sav	-0.349	0.186	-1.881	0.060	-0.713	0.015
Group Var	0.000					
species:plant_id Var	0.000	0.030				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.2113
Min. group size:	2	Log-Likelihood:	-104.2175
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.555	0.477	1.165	0.244	-0.379	1.490
species[T.ARTCAL]	-0.948					
species[T.CEAGRI]	0.208	0.651	0.320	0.749	-1.067	1.484
species[T.ERIKAR]	0.019	0.815	0.023	0.982	-1.579	1.616
species[T.HETARB]	-2.082	2.723	-0.765	0.444	-7.418	3.254
species[T.MALLAU]	-0.088	0.524	-0.167	0.867	-1.114	0.939
species[T.SALAPI]	-0.437	0.498	-0.879	0.380	-1.413	0.538
species[T.SALLEU]	-0.593	0.567	-1.045	0.296	-1.705	0.519
LMA	-0.334	0.271	-1.232	0.218	-0.865	0.197
LMA:species[T.ARTCAL]	0.118					
LMA:species[T.CEAGRI]	-2.049	0.786	-2.608	0.009	-3.589	-0.509
LMA:species[T.ERIKAR]	0.413	0.672	0.616	0.538	-0.903	1.730
LMA:species[T.HETARB]	1.127	2.570	0.438	0.661	-3.911	6.164
LMA:species[T.MALLAU]	-0.264	0.341	-0.775	0.438	-0.932	0.404
LMA:species[T.SALAPI]	0.006	0.375	0.015	0.988	-0.730	0.741
LMA:species[T.SALLEU]	0.369	0.523	0.705	0.481	-0.657	1.395
lfm	-0.404	0.109	-3.716	0.000	-0.617	-0.191
sample_wt	0.177	0.064	2.758	0.006	0.051	0.304
leaf_mass_ratio	-0.180	0.086	-2.085	0.037	-0.350	-0.011
branching	0.149	0.055	2.715	0.007	0.042	0.257
mpa	0.126	0.053	2.374	0.018	0.022	0.230
start_temp	-0.358	0.055	-6.529	0.000	-0.466	-0.251
dmc	-0.183	0.102	-1.797	0.072	-0.382	0.017
leaf_sav	-0.255	0.114	-2.244	0.025	-0.478	-0.032
thickness	-0.273	0.121	-2.256	0.024	-0.510	-0.036
Group Var	0.000					
species:plant_id Var	0.001	0.031				

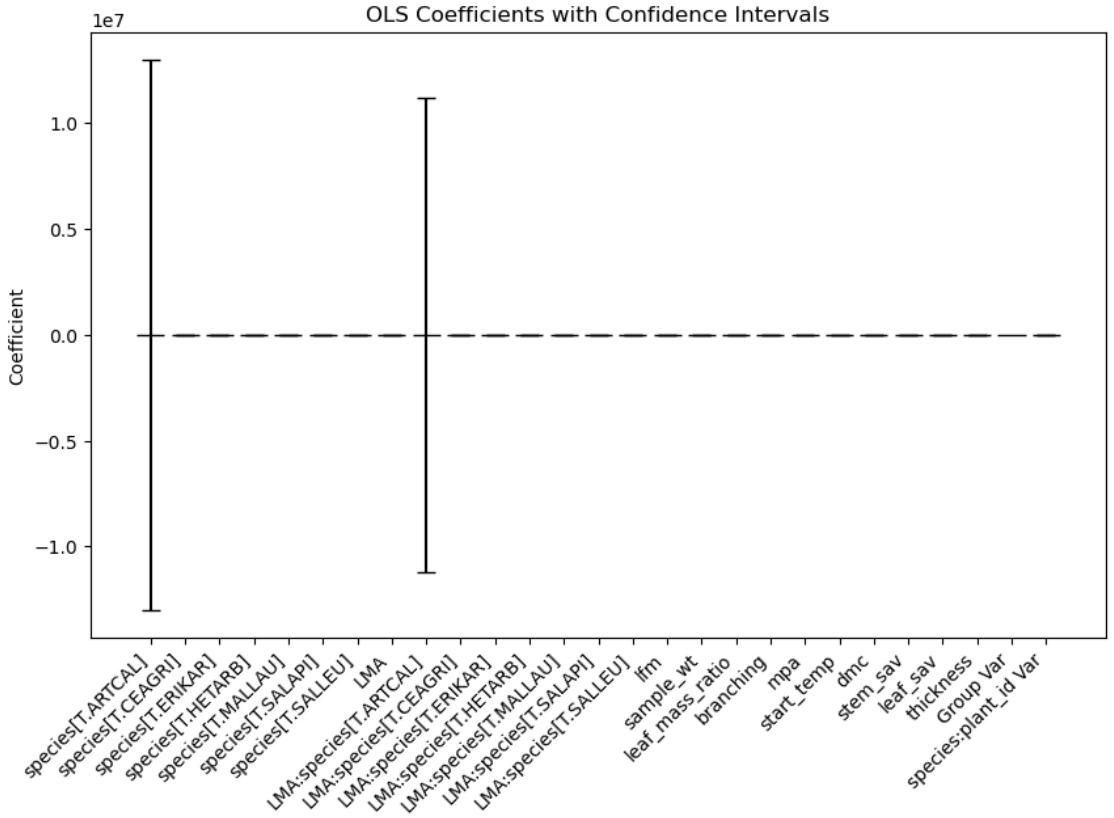


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.2061
Min. group size:	2	Log-Likelihood:	-103.2896
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.500	0.476	1.049	0.294	-0.434	1.434
species[T.ARTCAL]	-0.583	6629599.260	-0.000	1.000	-12993776.365	12993775.200
species[T.CEAGRI]	0.128	0.656	0.195	0.845	-1.158	1.414
species[T.ERIKAR]	1.018	1.115	0.913	0.361	-1.168	3.204
species[T.HETARB]	-2.083	2.709	-0.769	0.442	-7.392	3.226
species[T.MALLAU]	-0.148	0.523	-0.282	0.778	-1.173	0.877
species[T.SALAPI]	-0.519	0.500	-1.039	0.299	-1.499	0.460
species[T.SALLEU]	-0.623	0.566	-1.100	0.271	-1.732	0.487
LMA	-0.385	0.273	-1.410	0.159	-0.919	0.150
LMA:species[T.ARTCAL]	0.454	5704991.984	0.000	1.000	-11181578.367	11181579.275

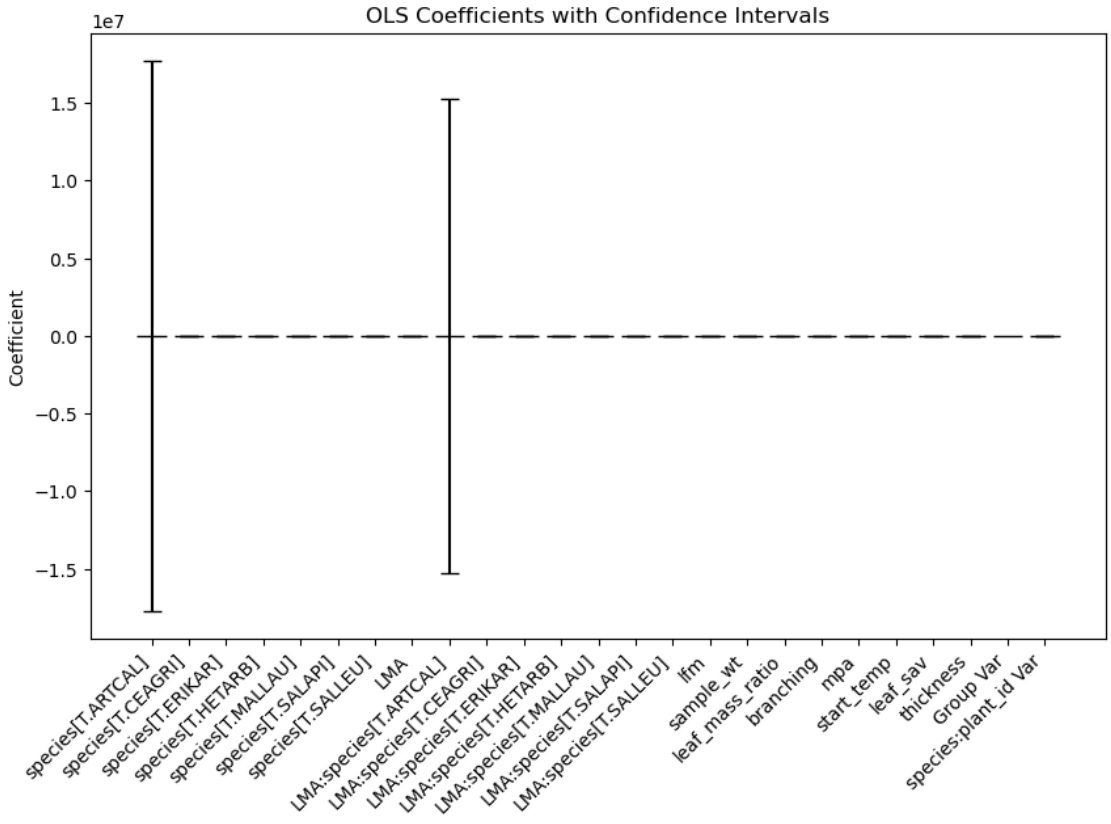
LMA:species[T.CEAGRI]	-2.051	0.796	-2.578	0.010	-3.611	-0.492
LMA:species[T.ERIKAR]	0.916	0.779	1.175	0.240	-0.612	2.443
LMA:species[T.HETARB]	1.069	2.558	0.418	0.676	-3.944	6.082
LMA:species[T.MALLAU]	-0.250	0.340	-0.736	0.462	-0.916	0.416
LMA:species[T.SALAPI]	0.064	0.379	0.169	0.866	-0.678	0.806
LMA:species[T.SALLEU]	0.524	0.536	0.978	0.328	-0.526	1.575
lfm	-0.479	0.123	-3.887	0.000	-0.721	-0.238
sample_wt	0.180	0.064	2.817	0.005	0.055	0.306
leaf_mass_ratio	-0.178	0.087	-2.041	0.041	-0.349	-0.007
branching	0.146	0.055	2.683	0.007	0.039	0.253
mpa	0.126	0.053	2.376	0.017	0.022	0.230
start_temp	-0.358	0.055	-6.505	0.000	-0.466	-0.250
dmc	-0.243	0.111	-2.191	0.028	-0.460	-0.026
stem_sav	-0.258	0.194	-1.327	0.185	-0.638	0.123
leaf_sav	-0.215	0.119	-1.803	0.071	-0.449	0.019
thickness	-0.237	0.126	-1.877	0.061	-0.484	0.011
Group Var	0.000					
species:plant_id Var	0.004	0.035				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.2004
Min. group size:	2	Log-Likelihood:	-105.9320
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.551	0.486	1.134	0.257	-0.402	1.504
species[T.ARTCAL]	1.401	9042864.424	0.000	1.000	-17723687.188	17723689.989
species[T.CEAGRI]	0.123	0.695	0.177	0.860	-1.239	1.485
species[T.ERIKAR]	-0.098	0.891	-0.110	0.913	-1.845	1.649
species[T.HETARB]	-1.905	2.766	-0.689	0.491	-7.326	3.515
species[T.MALLAU]	-0.100	0.533	-0.187	0.852	-1.145	0.945
species[T.SALAPI]	-0.420	0.510	-0.823	0.410	-1.420	0.580
species[T.SALLEU]	-0.890	0.559	-1.593	0.111	-1.985	0.205
LMA	-0.265	0.275	-0.964	0.335	-0.805	0.274
LMA:species[T.ARTCAL]	1.984	7781687.403	0.000	1.000	-15251825.065	15251829.034
LMA:species[T.CEAGRI]	-1.852	0.868	-2.133	0.033	-3.554	-0.151
LMA:species[T.ERIKAR]	0.250	0.747	0.335	0.738	-1.215	1.715
LMA:species[T.HETARB]	0.878	2.610	0.337	0.736	-4.236	5.993
LMA:species[T.MALLAU]	-0.306	0.348	-0.880	0.379	-0.987	0.375
LMA:species[T.SALAPI]	-0.055	0.391	-0.140	0.889	-0.821	0.712
LMA:species[T.SALLEU]	-0.021	0.490	-0.043	0.966	-0.981	0.939
lfm	-0.347	0.114	-3.037	0.002	-0.572	-0.123
sample_wt	0.156	0.064	2.442	0.015	0.031	0.281
leaf_mass_ratio	-0.087	0.077	-1.128	0.260	-0.237	0.064
branching	0.160	0.054	2.965	0.003	0.054	0.266
mpa	0.114	0.054	2.089	0.037	0.007	0.220
start_temp	-0.366	0.057	-6.392	0.000	-0.479	-0.254
leaf_sav	-0.299	0.125	-2.389	0.017	-0.544	-0.054
thickness	-0.352	0.131	-2.699	0.007	-0.608	-0.097
Group Var	0.000					
species:plant_id Var	0.018	0.054				

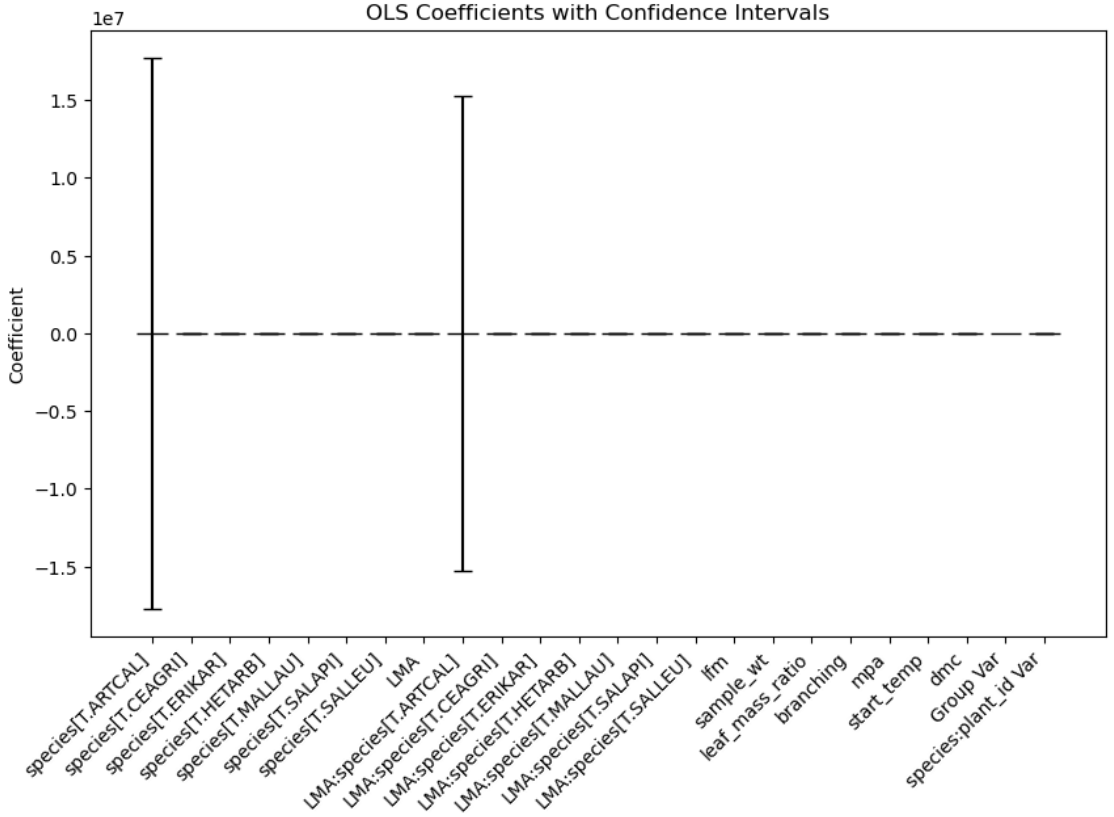


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.2155
Min. group size:	2	Log-Likelihood:	-106.9360
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.636	0.484	1.314	0.189	-0.313	1.584
species[T.ARTCAL]	-4.413	9042864.424	-0.000	1.000	-17723693.002	17723684.175
species[T.CEAGRI]	0.350	0.658	0.532	0.595	-0.939	1.639
species[T.ERIKAR]	-0.113	0.838	-0.135	0.893	-1.756	1.530
species[T.HETARB]	-2.537	2.761	-0.919	0.358	-7.947	2.874
species[T.MALLAU]	-0.140	0.533	-0.263	0.793	-1.184	0.904
species[T.SALAPI]	-0.515	0.505	-1.020	0.308	-1.505	0.475
species[T.SALLEU]	-0.497	0.574	-0.866	0.387	-1.623	0.628
LMA	-0.397	0.270	-1.470	0.142	-0.926	0.132
LMA:species[T.ARTCAL]	-2.677	7781687.403	-0.000	1.000	-15251829.727	15251824.372

LMA:species[T.CEAGRI]	-2.157	0.796	-2.710	0.007	-3.717	-0.597
LMA:species[T.ERIKAR]	0.610	0.689	0.885	0.376	-0.741	1.960
LMA:species[T.HETARB]	1.651	2.602	0.634	0.526	-3.449	6.751
LMA:species[T.MALLAU]	-0.108	0.337	-0.319	0.750	-0.769	0.554
LMA:species[T.SALAPI]	0.146	0.365	0.399	0.690	-0.570	0.862
LMA:species[T.SALLEU]	0.713	0.479	1.489	0.136	-0.225	1.651
lfm	-0.324	0.103	-3.164	0.002	-0.525	-0.123
sample_wt	0.199	0.065	3.083	0.002	0.073	0.326
leaf_mass_ratio	-0.194	0.088	-2.190	0.029	-0.367	-0.020
branching	0.131	0.055	2.399	0.016	0.024	0.238
mpa	0.125	0.054	2.303	0.021	0.019	0.231
start_temp	-0.326	0.051	-6.407	0.000	-0.426	-0.226
dmc	-0.240	0.100	-2.410	0.016	-0.436	-0.045
Group Var	0.000					
species:plant_id Var	0.003	0.032				

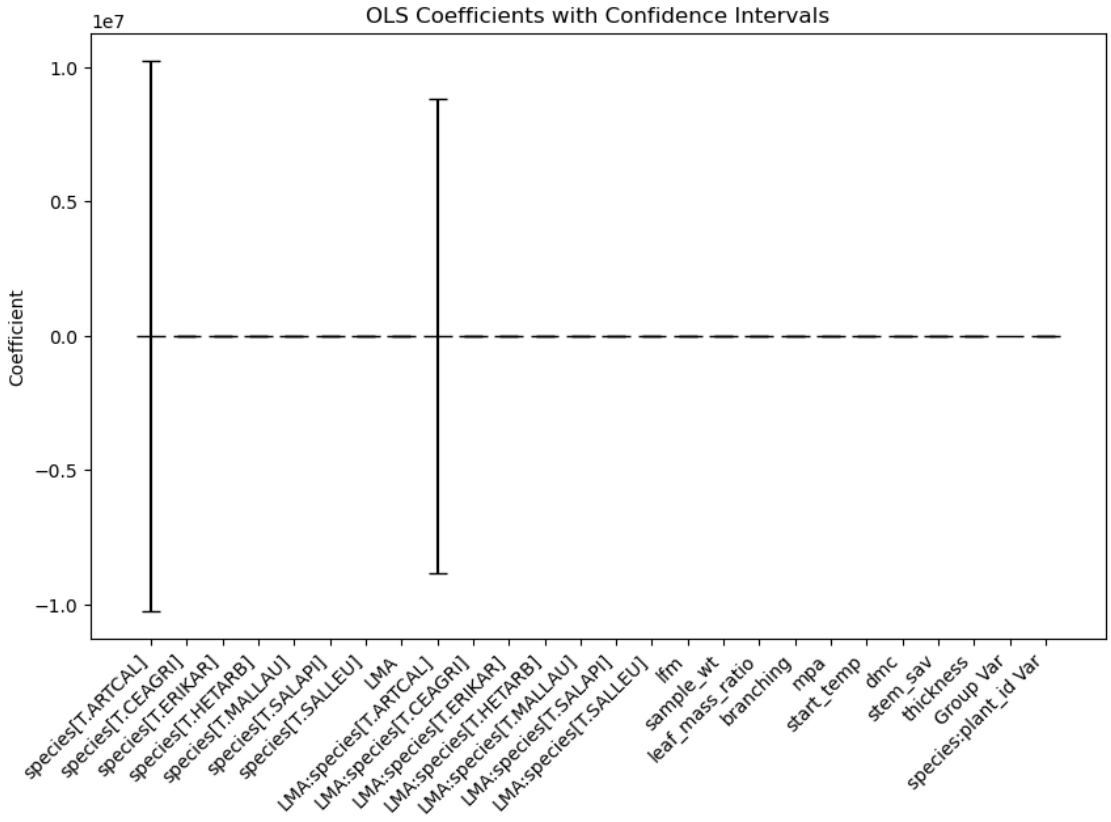


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML

No. Groups:	8	Scale:	0.2137
Min. group size:	2	Log-Likelihood:	-104.9555
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.534	0.480	1.112	0.266	-0.407	1.475
species[T.ARTCAL]	-0.264	5220900.210	-0.000	1.000	-10232776.642	10232776.113
species[T.CEAGRI]	0.251	0.652	0.384	0.701	-1.027	1.529
species[T.ERIKAR]	1.283	1.098	1.168	0.243	-0.870	3.435
species[T.HETARB]	-2.397	2.730	-0.878	0.380	-7.747	2.953
species[T.MALLAU]	-0.210	0.527	-0.398	0.690	-1.242	0.822
species[T.SALAPI]	-0.594	0.502	-1.183	0.237	-1.579	0.390
species[T.SALLEU]	-0.583	0.570	-1.022	0.307	-1.700	0.535
LMA	-0.431	0.274	-1.575	0.115	-0.968	0.106
LMA:species[T.ARTCAL]	0.849	4492759.317	0.000	1.000	-8805645.603	8805647.302
LMA:species[T.CEAGRI]	-2.197	0.784	-2.803	0.005	-3.733	-0.661
LMA:species[T.ERIKAR]	1.240	0.752	1.649	0.099	-0.234	2.713
LMA:species[T.HETARB]	1.392	2.576	0.540	0.589	-3.657	6.442
LMA:species[T.MALLAU]	-0.154	0.338	-0.454	0.650	-0.817	0.510
LMA:species[T.SALAPI]	0.154	0.377	0.408	0.683	-0.585	0.893
LMA:species[T.SALLEU]	0.770	0.528	1.457	0.145	-0.265	1.805
lfm	-0.435	0.120	-3.618	0.000	-0.670	-0.199
sample_wt	0.200	0.064	3.119	0.002	0.074	0.326
leaf_mass_ratio	-0.187	0.087	-2.154	0.031	-0.358	-0.017
branching	0.140	0.055	2.539	0.011	0.032	0.248
mpa	0.123	0.054	2.301	0.021	0.018	0.228
start_temp	-0.347	0.055	-6.324	0.000	-0.455	-0.240
dmc	-0.291	0.107	-2.711	0.007	-0.501	-0.081
stem_sav	-0.348	0.186	-1.877	0.061	-0.712	0.015
thickness	-0.038	0.061	-0.618	0.536	-0.157	0.082
Group Var	0.000					
species:plant_id Var	0.000	0.031				

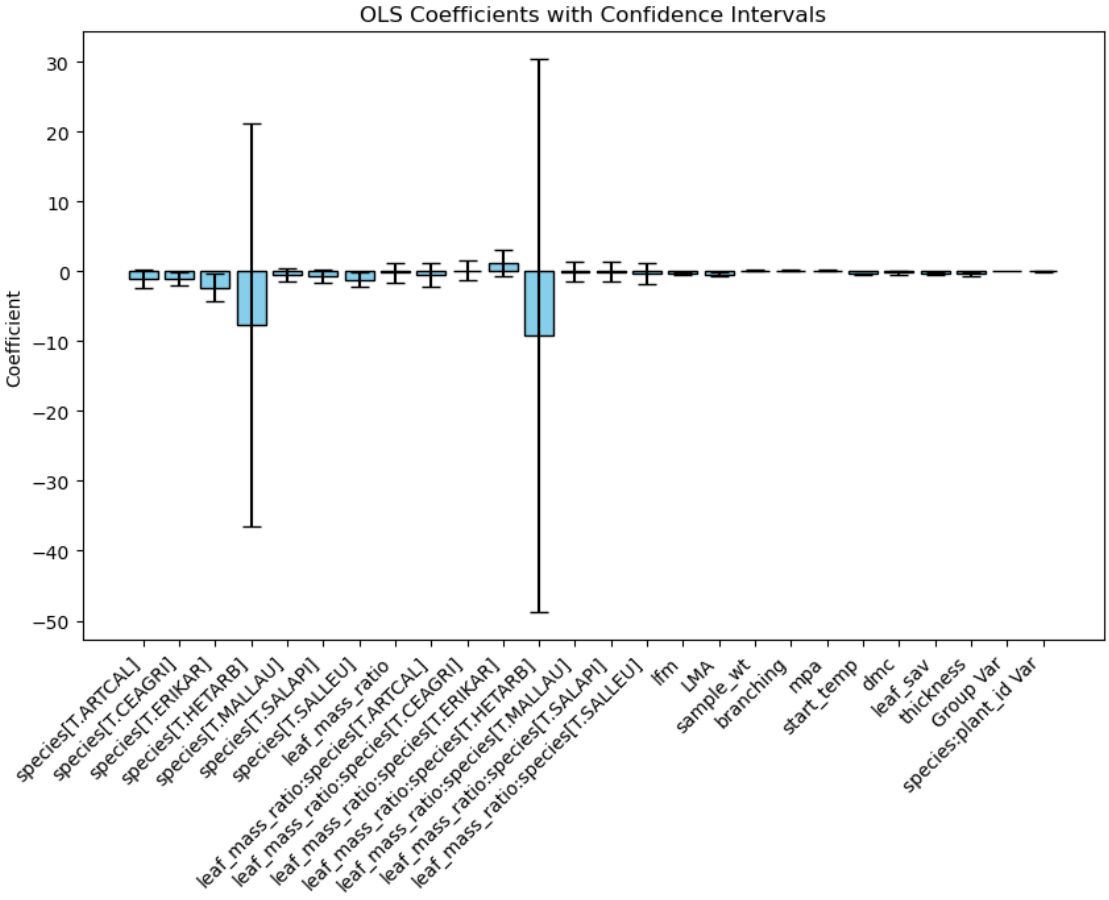


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.2121
Min. group size:	2	Log-Likelihood:	-105.0535
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.768	0.446	1.722	0.085	-0.106	1.642
species[T.ARTCAL]	-1.052	0.699	-1.505	0.132	-2.423	0.318
species[T.CEAGRI]	-1.019	0.470	-2.167	0.030	-1.941	-0.097
species[T.ERIKAR]	-2.348	1.013	-2.317	0.021	-4.334	-0.362
species[T.HETARB]	-7.710	14.731	-0.523	0.601	-36.583	21.163
species[T.MALLAU]	-0.450	0.476	-0.946	0.344	-1.384	0.483
species[T.SALAPI]	-0.684	0.466	-1.468	0.142	-1.598	0.230
species[T.SALLEU]	-1.169	0.498	-2.347	0.019	-2.145	-0.193
leaf_mass_ratio	-0.164	0.706	-0.232	0.817	-1.546	1.219
leaf_mass_ratio:species[T.ARTCAL]	-0.496	0.873	-0.568	0.570	-2.207	1.215

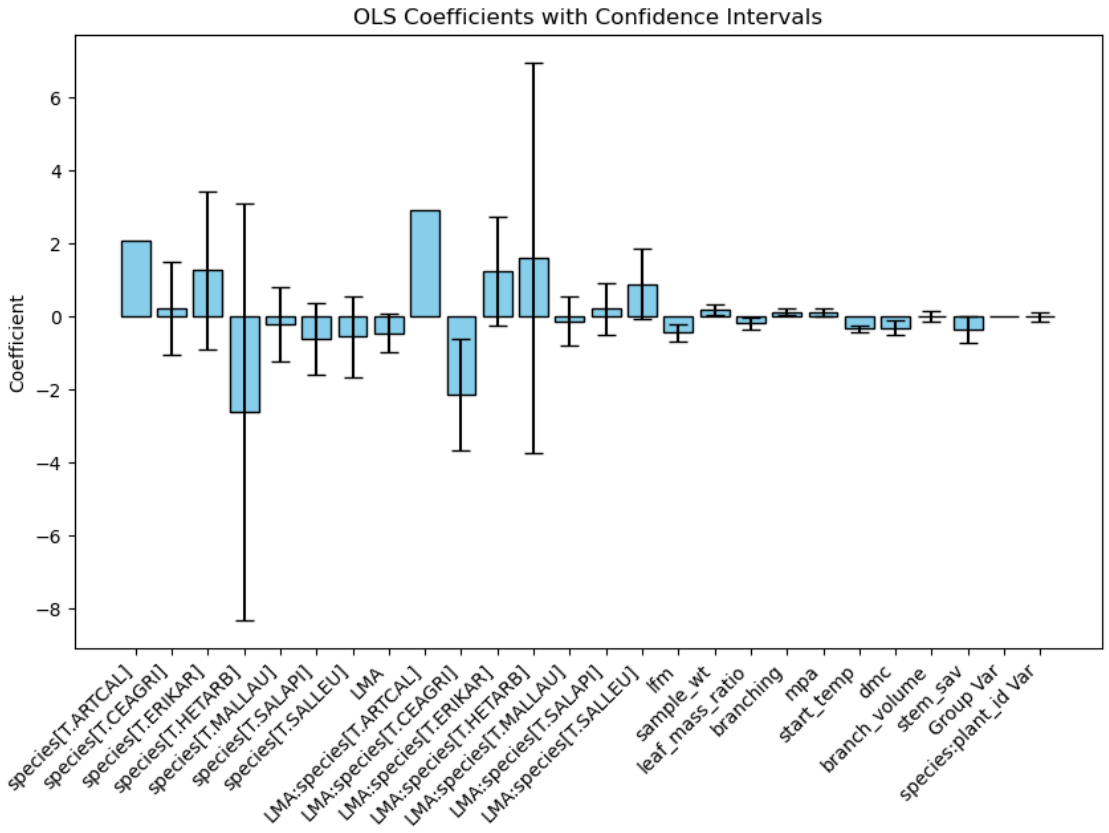
```
leaf_mass_ratio:species[T.CEAGRI]  0.150    0.719  0.208 0.835  -1.260  1.560
leaf_mass_ratio:species[T.ERIKAR]  1.176    0.999  1.177 0.239  -0.782  3.134
leaf_mass_ratio:species[T.HETARB] -9.266   20.203 -0.459 0.646 -48.863 30.330
leaf_mass_ratio:species[T.MALLAU] -0.051    0.732 -0.069 0.945  -1.485  1.384
leaf_mass_ratio:species[T.SALAPI] -0.065    0.715 -0.091 0.928  -1.467  1.337
leaf_mass_ratio:species[T.SALLEU] -0.302    0.763 -0.396 0.692  -1.799  1.194
lfm                               -0.351    0.100 -3.507 0.000  -0.547 -0.155
LMA                               -0.483    0.139 -3.478 0.001  -0.755 -0.211
sample_wt                          0.147    0.064  2.305 0.021   0.022  0.273
branching                          0.153    0.054  2.845 0.004   0.047  0.258
mpa                                0.084    0.054  1.560 0.119  -0.022  0.190
start_temp                        -0.390    0.061 -6.413 0.000  -0.509 -0.271
dmc                               -0.212    0.123 -1.732 0.083  -0.453  0.028
leaf_sav                          -0.331    0.135 -2.454 0.014  -0.596 -0.067
thickness                         -0.382    0.130 -2.930 0.003  -0.637 -0.126
Group Var                          0.000
species:plant_id Var               0.002    0.033
================================================================================
```



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	temp_change
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.2140
Min. group size:	2	Log-Likelihood:	-105.1071
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.544	0.481	1.132	0.257	-0.398	1.486
species[T.ARTCAL]	2.089					
species[T.CEAGRI]	0.216	0.653	0.330	0.741	-1.063	1.495
species[T.ERIKAR]	1.270	1.101	1.153	0.249	-0.889	3.429
species[T.HETARB]	-2.602	2.914	-0.893	0.372	-8.313	3.110
species[T.MALLAU]	-0.208	0.527	-0.394	0.693	-1.241	0.825
species[T.SALAPI]	-0.619	0.501	-1.235	0.217	-1.601	0.363
species[T.SALLEU]	-0.542	0.567	-0.956	0.339	-1.654	0.570
LMA	-0.461	0.270	-1.708	0.088	-0.989	0.068
LMA:species[T.ARTCAL]	2.910					
LMA:species[T.CEAGRI]	-2.140	0.787	-2.720	0.007	-3.682	-0.598
LMA:species[T.ERIKAR]	1.249	0.755	1.654	0.098	-0.231	2.729
LMA:species[T.HETARB]	1.613	2.726	0.592	0.554	-3.731	6.956
LMA:species[T.MALLAU]	-0.128	0.340	-0.377	0.706	-0.795	0.539
LMA:species[T.SALAPI]	0.214	0.363	0.589	0.556	-0.498	0.926
LMA:species[T.SALLEU]	0.897	0.484	1.852	0.064	-0.052	1.846
lfm	-0.442	0.120	-3.677	0.000	-0.678	-0.207
sample_wt	0.194	0.077	2.523	0.012	0.043	0.344
leaf_mass_ratio	-0.187	0.089	-2.105	0.035	-0.361	-0.013
branching	0.134	0.054	2.461	0.014	0.027	0.240
mpa	0.124	0.054	2.303	0.021	0.018	0.229
start_temp	-0.334	0.050	-6.640	0.000	-0.432	-0.235
dmc	-0.308	0.105	-2.922	0.003	-0.514	-0.101
branch_volume	0.013	0.075	0.167	0.867	-0.135	0.160
stem_sav	-0.350	0.186	-1.881	0.060	-0.714	0.015
Group Var	0.000					
species:plant_id Var	0.000	0.031				



7 Heat Flux Change

[13]:
```
yvar='heat_flux_change'
cols=cols_use
df=flam
compare_predictors_mixedeff(df, cols, yvar)
```

	cols	aics	pvals	coefs	top_mod
0	thickness	412.755489	0.018575	8.731548e-01	True
1	mpa	411.997205	-0.076142	3.758305e-01	True
2	dmc	410.897627	0.147214	1.630031e-01	True
3	species	410.286512	-1.035451	4.592281e-02	False
4	branching	410.177288	0.127608	1.048537e-01	False
5	leaf_mass_ratio	410.129840	-0.209494	8.185376e-02	False
6	leaf_sav	409.878494	-0.232572	8.228504e-02	False
7	start_temp	408.717362	0.185878	4.241968e-02	False
8	lfm	407.170292	-0.341791	1.955246e-02	False
9	stem_sav	405.824626	-0.375070	1.278106e-03	False
10	LMA	394.396642	0.515376	2.286915e-06	False
11	branch_volume	384.376755	0.397924	7.332081e-09	False

```
12        sample_wt  329.865131  0.683418  1.428780e-20    False
```

[14]:
```
AIC_iterator(flam, cols_use, Y_VAR='heat_flux_change',
             minnumsingle=mns, maxnumsingle=mxs, minnumint=mni, maxnumint=mxi)
```

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

Columns present in sig. interaction terms: {'leaf_mass_ratio', 'branching',
'species'}

Total Num. Cols : Num. Sig. Int. Cols;  13 : 3

Significant Interactions:
('leaf_mass_ratio', 'species')
('branching', 'species')

Number of formulas: 5120
ERROR: Formula model error: heat_flux_change ~ branching*species + LMA
ERROR: Formula model error: heat_flux_change ~ branching*species + mpa
ERROR: Formula model error: heat_flux_change ~ branching*species + stem_sav
ERROR: Formula model error: heat_flux_change ~ branching*species + lfm + LMA
ERROR: Formula model error: heat_flux_change ~ branching*species + lfm +
leaf_mass_ratio
ERROR: Formula model error: heat_flux_change ~ branching*species + lfm + dmc
ERROR: Formula model error: heat_flux_change ~ branching*species + lfm +
branch_volume
ERROR: Formula model error: heat_flux_change ~ branching*species + lfm +
stem_sav
ERROR: Formula model error: heat_flux_change ~ branching*species + LMA +
sample_wt
ERROR: Formula model error: heat_flux_change ~ branching*species + LMA +
stem_sav
ERROR: Formula model error: heat_flux_change ~ branching*species +
leaf_mass_ratio + stem_sav
ERROR: Formula model error: heat_flux_change ~ branching*species + mpa +
stem_sav
ERROR: Formula model error: heat_flux_change ~ branching*species + start_temp +
dmc
ERROR: Formula model error: heat_flux_change ~ branching*species + dmc +
stem_sav
ERROR: Formula model error: heat_flux_change ~ branching*species + stem_sav +
thickness
ERROR: Formula model error: heat_flux_change ~ branching*species + lfm + LMA +
sample_wt
ERROR: Formula model error: heat_flux_change ~ branching*species + lfm + LMA +
mpa
ERROR: Formula model error: heat_flux_change ~ branching*species + lfm +
sample_wt + branch_volume
```

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

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

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

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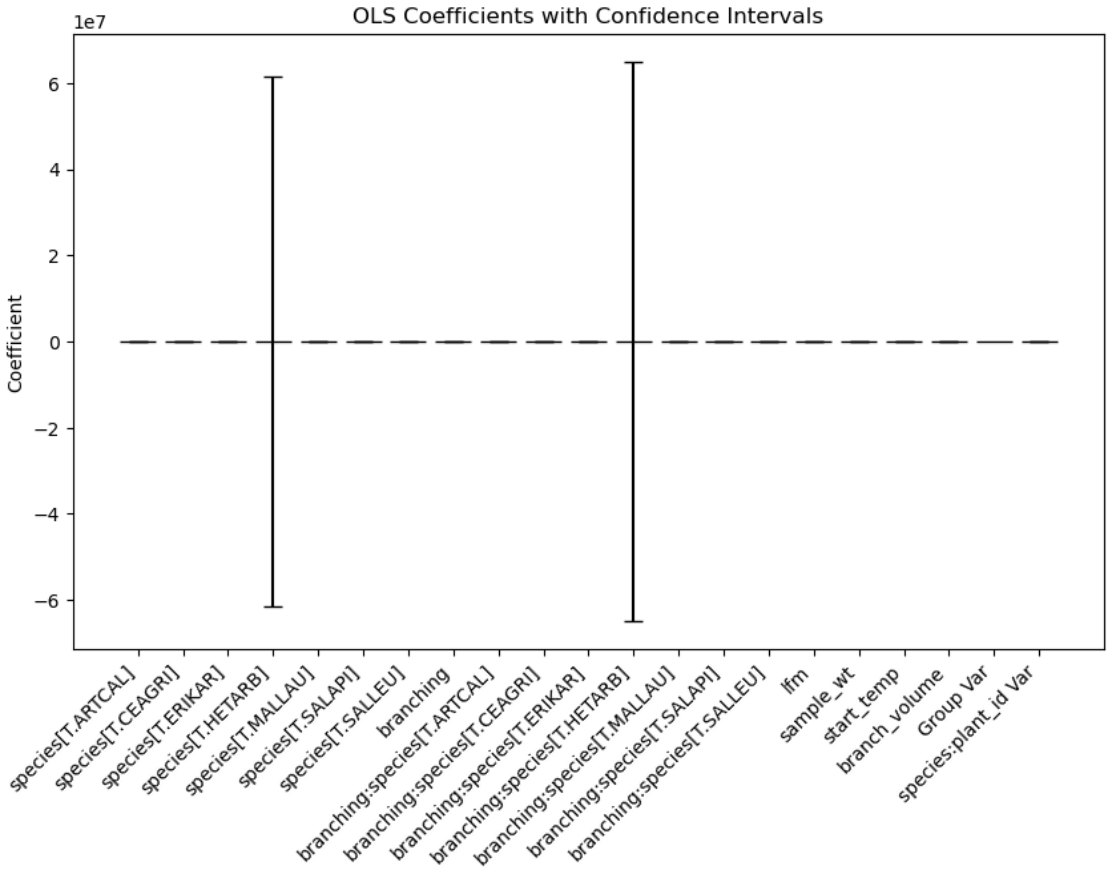
ERROR: Formula model error: heat_flux_change ~ leaf_mass_ratio*species +
branching*species + sample_wt + dmc + stem_sav + leaf_sav + thickness
ERROR: Formula model error: heat_flux_change ~ leaf_mass_ratio*species +
branching*species + lfm + LMA + sample_wt + mpa + dmc + stem_sav
ERROR: Formula model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


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

```
                          Mixed Linear Model Regression Results
==========================================================================
=======
Model:                      MixedLM          Dependent Variable:
heat_flux_change
No. Observations:           162              Method:                     ML
No. Groups:                 8                Scale:                      0.1849
Min. group size:            2                Log-Likelihood:             -144.3242
Max. group size:            37               Converged:                  Yes
Mean group size:            20.2
--------------------------------------------------------------------------
-------
                             Coef.    Std.Err.      z    P>|z|     [0.025
0.975]
--------------------------------------------------------------------------
-------
Intercept                     0.557        0.432  1.291 0.197        -0.289
1.403
species[T.ARTCAL]            -1.125        0.538 -2.092 0.036        -2.180
-0.071
species[T.CEAGRI]            -0.654        0.544 -1.202 0.229        -1.720
0.412
species[T.ERIKAR]            -0.153        0.598 -0.256 0.798        -1.324
1.018
species[T.HETARB]            -1.152 31389310.945 -0.000 1.000 -61521920.104
61521917.799
species[T.MALLAU]            -0.883        0.516 -1.710 0.087        -1.894
0.129
species[T.SALAPI]            -0.429        0.517 -0.830 0.407        -1.442
0.584
species[T.SALLEU]            -0.800        0.539 -1.484 0.138        -1.856
0.257
branching                     0.362        0.305  1.188 0.235        -0.236
0.961
branching:species[T.ARTCAL] -0.409        0.346 -1.183 0.237        -1.087
0.269
branching:species[T.CEAGRI] -0.370        0.322 -1.152 0.249        -1.001
0.260
branching:species[T.ERIKAR] -0.331        0.457 -0.724 0.469        -1.228
0.566
branching:species[T.HETARB] -0.618 33123648.776 -0.000 1.000 -64921159.256
64921158.020
branching:species[T.MALLAU] -0.511        0.350 -1.459 0.144        -1.197
0.175
branching:species[T.SALAPI] -0.258        0.381 -0.678 0.498        -1.004
0.488
```

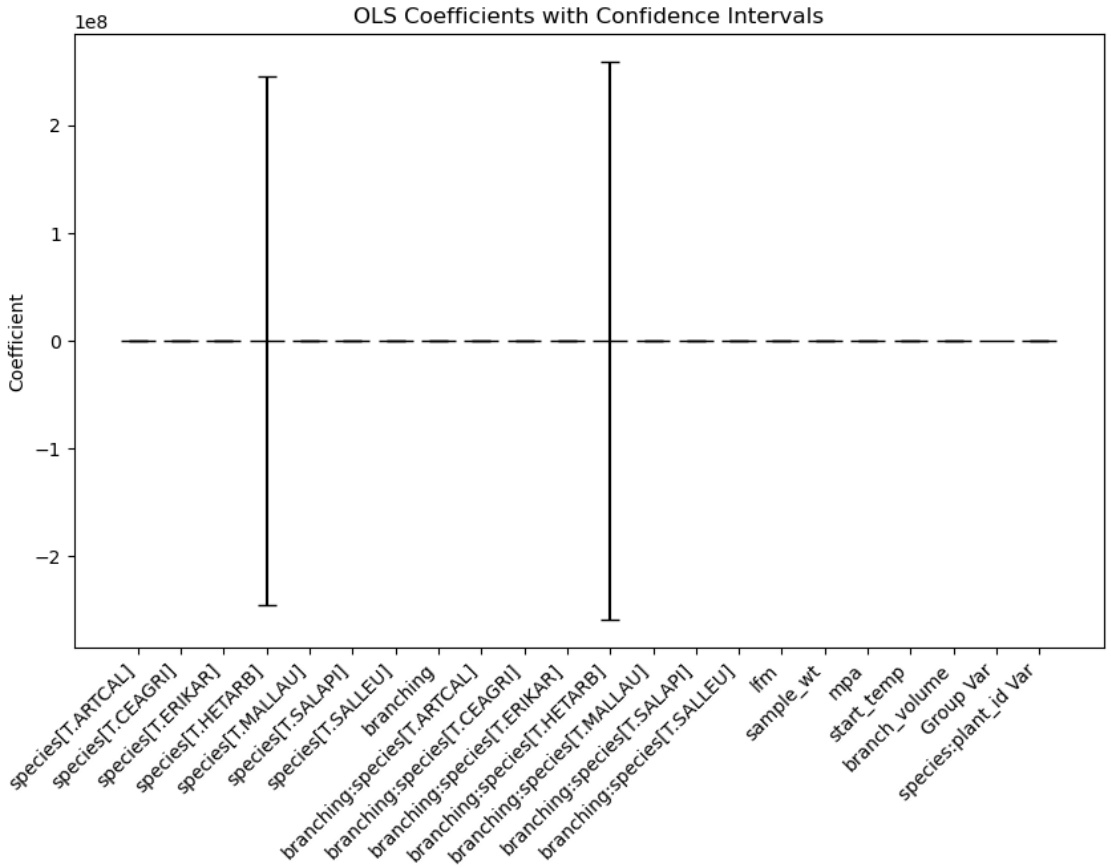
```
branching:species[T.SALLEU] -0.276        0.322 -0.858 0.391        -0.907
0.355
lfm                         -0.332        0.172 -1.931 0.053        -0.670
0.005
sample_wt                    0.824        0.089  9.258 0.000         0.649
0.998
start_temp                   0.302        0.071  4.264 0.000         0.163
0.440
branch_volume               -0.140        0.080 -1.752 0.080        -0.296
0.017
Group Var                    0.005
species:plant_id Var         0.412        0.285
================================================================================
=======
```




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

```
heat_flux_change
No. Observations:            162             Method:                        ML
No. Groups:                  8               Scale:
0.1771
Min. group size:             2               Log-Likelihood:
-143.5417
Max. group size:             37              Converged:                     Yes
Mean group size:             20.2
------------------------------------------------------------------------------
-----------
                            Coef.     Std.Err.     z    P>|z|     [0.025
0.975]
------------------------------------------------------------------------------
-----------
Intercept                    0.565         0.435  1.297 0.195         -0.289
1.418
species[T.ARTCAL]           -1.156         0.542 -2.133 0.033         -2.218
-0.094
species[T.CEAGRI]           -0.757         0.554 -1.366 0.172         -1.844
0.330
species[T.ERIKAR]           -0.130         0.601 -0.216 0.829         -1.308
1.048
species[T.HETARB]          732.926 125006267.351  0.000 1.000 -245007048.924
245008514.776
species[T.MALLAU]           -0.862         0.518 -1.665 0.096         -1.877
0.153
species[T.SALAPI]           -0.393         0.520 -0.757 0.449         -1.412
0.625
species[T.SALLEU]           -0.780         0.544 -1.432 0.152         -1.847
0.287
branching                    0.413         0.305  1.352 0.176         -0.185
1.010
branching:species[T.ARTCAL] -0.436         0.345 -1.265 0.206         -1.111
0.240
branching:species[T.CEAGRI] -0.454         0.324 -1.400 0.161         -1.090
0.182
branching:species[T.ERIKAR] -0.369         0.453 -0.814 0.415         -1.258
0.519
branching:species[T.HETARB] 773.925 131913175.853  0.000 1.000 -258544299.833
258545847.682
branching:species[T.MALLAU] -0.567         0.349 -1.626 0.104         -1.251
0.117
branching:species[T.SALAPI] -0.322         0.381 -0.844 0.399         -1.069
0.426
branching:species[T.SALLEU] -0.326         0.321 -1.016 0.310         -0.956
0.303
lfm                         -0.342         0.175 -1.957 0.050         -0.684
0.001
```

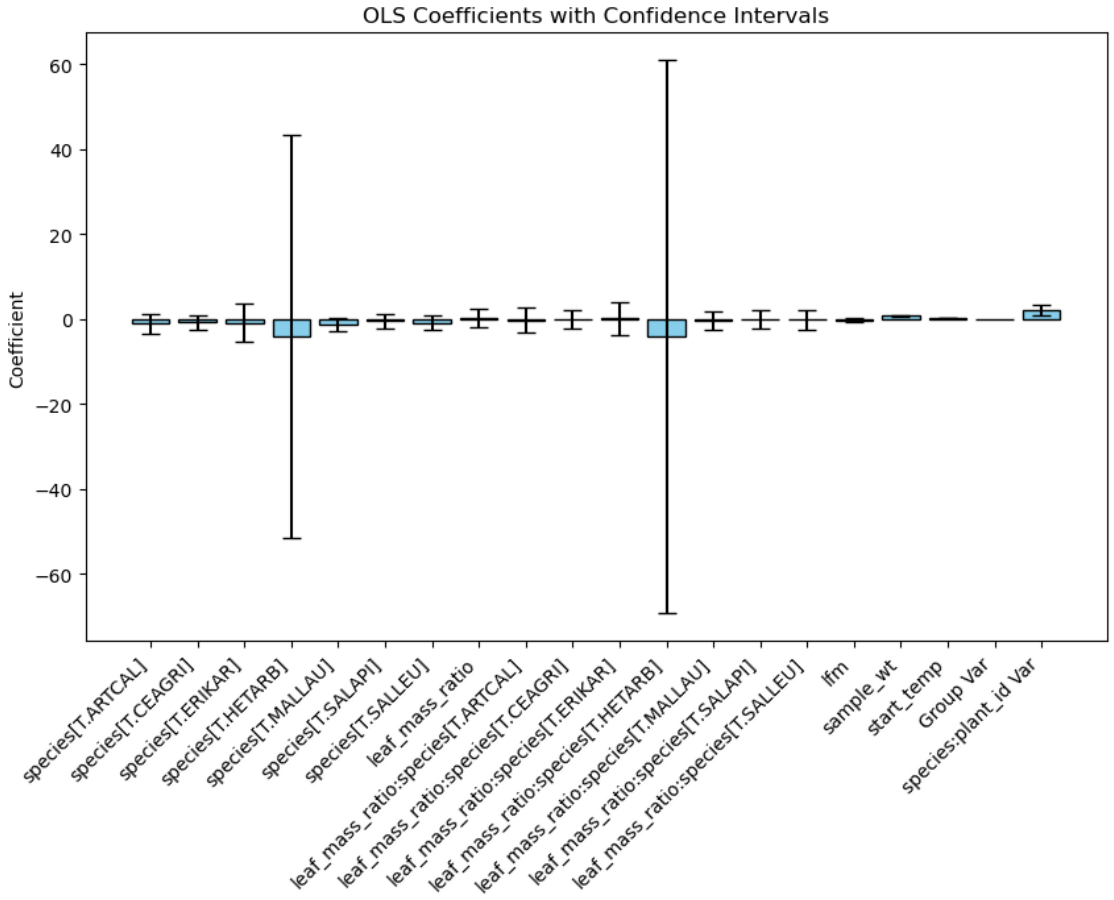
```
sample_wt                    0.842          0.089   9.440 0.000           0.667
1.016
mpa                          0.080          0.066   1.210 0.226          -0.050
0.211
start_temp                   0.314          0.070   4.493 0.000           0.177
0.451
branch_volume               -0.147          0.079  -1.860 0.063          -0.301
0.008
Group Var                    0.002
species:plant_id Var         0.449          0.322
================================================================================
===========
```



Mixed Linear Model Regression Results

```
================================================================================
Model:                MixedLM      Dependent Variable:      heat_flux_change
No. Observations:     162          Method:                  ML
No. Groups:           8            Scale:                   0.1925
Min. group size:      2            Log-Likelihood:          -145.5898
```

```
Max. group size:       37           Converged:               Yes
Mean group size:       20.2
------------------------------------------------------------------------------
                                 Coef.  Std.Err.   z    P>|z|  [0.025 0.975]
------------------------------------------------------------------------------
Intercept                         0.742    0.782  0.948 0.343  -0.792  2.275
species[T.ARTCAL]                -1.134    1.206 -0.940 0.347  -3.497  1.229
species[T.CEAGRI]                -0.739    0.850 -0.870 0.384  -2.405  0.926
species[T.ERIKAR]                -0.935    2.291 -0.408 0.683  -5.426  3.555
species[T.HETARB]                -4.143   24.242 -0.171 0.864 -51.655 43.370
species[T.MALLAU]                -1.250    0.844 -1.481 0.139  -2.905  0.404
species[T.SALAPI]                -0.456    0.835 -0.546 0.585  -2.093  1.181
species[T.SALLEU]                -0.883    0.853 -1.035 0.300  -2.555  0.789
leaf_mass_ratio                   0.161    1.101  0.146 0.884  -1.998  2.319
leaf_mass_ratio:species[T.ARTCAL] -0.216    1.543 -0.140 0.889  -3.240  2.808
leaf_mass_ratio:species[T.CEAGRI] -0.066    1.156 -0.057 0.954  -2.331  2.199
leaf_mass_ratio:species[T.ERIKAR]  0.184    1.988  0.092 0.926  -3.713  4.080
leaf_mass_ratio:species[T.HETARB] -4.234   33.219 -0.127 0.899 -69.342 60.875
leaf_mass_ratio:species[T.MALLAU] -0.373    1.134 -0.329 0.742  -2.595  1.849
leaf_mass_ratio:species[T.SALAPI]  0.071    1.119  0.063 0.950  -2.123  2.265
leaf_mass_ratio:species[T.SALLEU] -0.208    1.117 -0.187 0.852  -2.397  1.981
lfm                               -0.217    0.164 -1.319 0.187  -0.539  0.105
sample_wt                         0.740    0.069 10.669 0.000   0.604  0.876
start_temp                        0.272    0.069  3.927 0.000   0.136  0.408
Group Var                         0.001
species:plant_id Var              0.396    0.294
==============================================================================
```

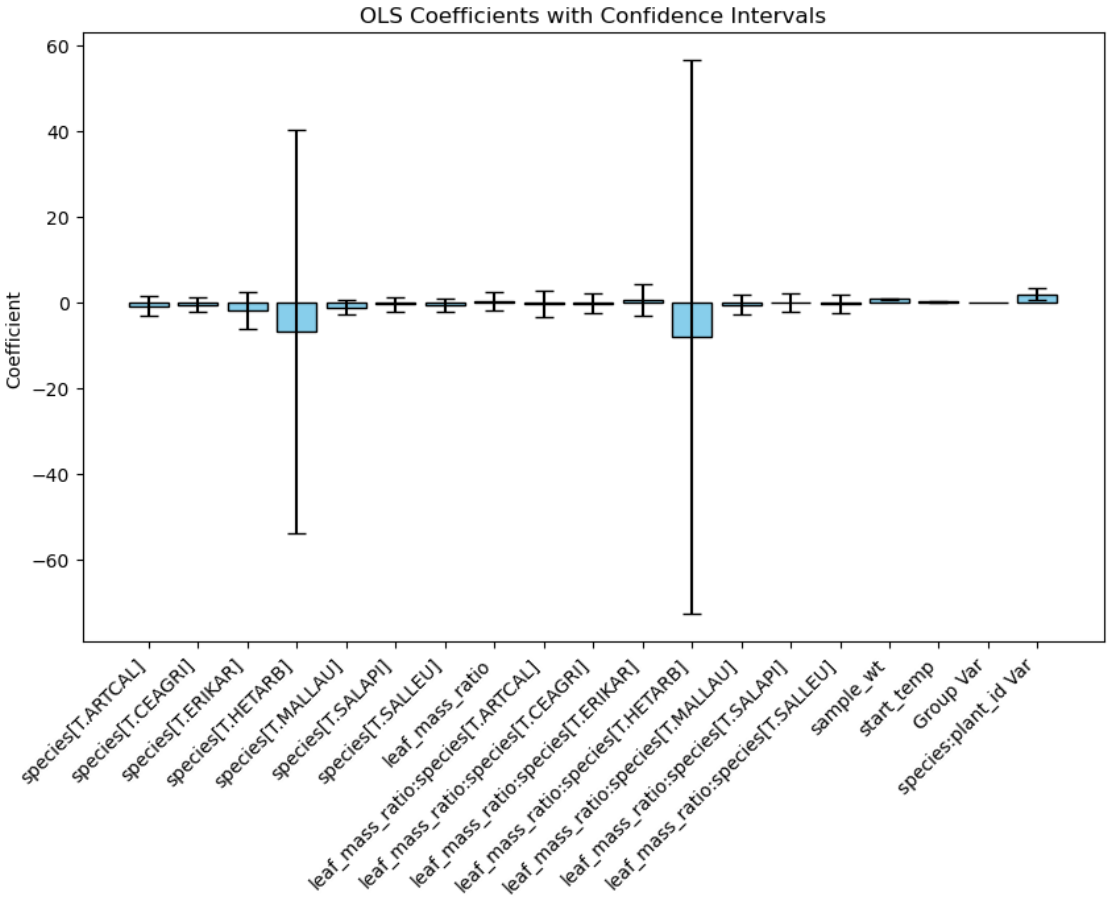


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	heat_flux_change
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.1967
Min. group size:	2	Log-Likelihood:	-146.7735
Max. group size:	37	Converged:	No
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.661	0.781	0.847	0.397	-0.870	2.193
species[T.ARTCAL]	-0.882	1.191	-0.740	0.459	-3.216	1.452
species[T.CEAGRI]	-0.491	0.833	-0.589	0.556	-2.124	1.143
species[T.ERIKAR]	-1.803	2.183	-0.826	0.409	-6.081	2.475
species[T.HETARB]	-6.803	24.080	-0.283	0.778	-53.999	40.393
species[T.MALLAU]	-1.159	0.847	-1.369	0.171	-2.818	0.500
species[T.SALAPI]	-0.475	0.840	-0.566	0.572	-2.122	1.171
species[T.SALLEU]	-0.636	0.837	-0.760	0.447	-2.276	1.004

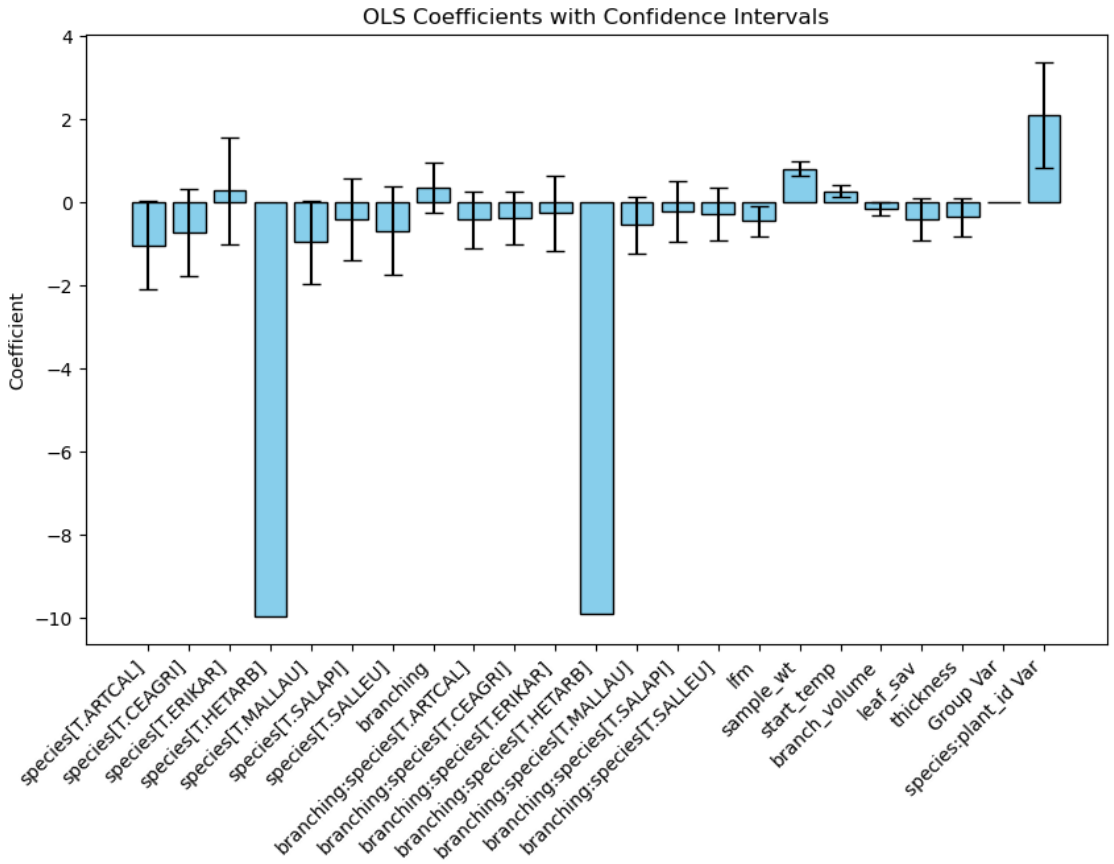
leaf_mass_ratio	0.287	1.093	0.262	0.793	-1.856	2.430
leaf_mass_ratio:species[T.ARTCAL]	-0.363	1.532	-0.237	0.813	-3.365	2.639
leaf_mass_ratio:species[T.CEAGRI]	-0.200	1.147	-0.175	0.861	-2.448	2.047
leaf_mass_ratio:species[T.ERIKAR]	0.580	1.954	0.297	0.766	-3.249	4.409
leaf_mass_ratio:species[T.HETARB]	-8.169	32.978	-0.248	0.804	-72.805	56.466
leaf_mass_ratio:species[T.MALLAU]	-0.486	1.128	-0.431	0.666	-2.697	1.724
leaf_mass_ratio:species[T.SALAPI]	-0.064	1.111	-0.057	0.954	-2.242	2.114
leaf_mass_ratio:species[T.SALLEU]	-0.379	1.106	-0.342	0.732	-2.546	1.789
sample_wt	0.761	0.068	11.148	0.000	0.627	0.894
start_temp	0.270	0.070	3.835	0.000	0.132	0.408
Group Var	0.008					
species:plant_id Var	0.388	0.286				



Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	heat_flux_change
No. Observations:	162	Method:	ML

```
No. Groups:           8         Scale:                0.1848
Min. group size:      2         Log-Likelihood:       -142.8413
Max. group size:      37        Converged:            Yes
Mean group size:      20.2
-------------------------------------------------------------------
                            Coef.  Std.Err.   z    P>|z| [0.025 0.975]
-------------------------------------------------------------------
Intercept                    0.454    0.432  1.052 0.293 -0.392  1.300
species[T.ARTCAL]           -1.023    0.539 -1.898 0.058 -2.080  0.033
species[T.CEAGRI]           -0.720    0.534 -1.350 0.177 -1.767  0.326
species[T.ERIKAR]            0.283    0.657  0.431 0.666 -1.004  1.571
species[T.HETARB]           -9.959
species[T.MALLAU]           -0.944    0.509 -1.854 0.064 -1.942  0.054
species[T.SALAPI]           -0.391    0.499 -0.783 0.434 -1.370  0.588
species[T.SALLEU]           -0.671    0.536 -1.253 0.210 -1.722  0.379
branching                    0.360    0.303  1.188 0.235 -0.234  0.954
branching:species[T.ARTCAL] -0.414    0.343 -1.207 0.227 -1.086  0.258
branching:species[T.CEAGRI] -0.362    0.320 -1.133 0.257 -0.989  0.264
branching:species[T.ERIKAR] -0.253    0.460 -0.551 0.582 -1.155  0.648
branching:species[T.HETARB] -9.882
branching:species[T.MALLAU] -0.531    0.348 -1.524 0.127 -1.214  0.152
branching:species[T.SALAPI] -0.213    0.379 -0.563 0.573 -0.956  0.529
branching:species[T.SALLEU] -0.280    0.320 -0.875 0.382 -0.907  0.347
lfm                         -0.444    0.187 -2.379 0.017 -0.809 -0.078
sample_wt                    0.808    0.089  9.034 0.000  0.633  0.984
start_temp                   0.282    0.076  3.719 0.000  0.133  0.430
branch_volume               -0.150    0.080 -1.875 0.061 -0.306  0.007
leaf_sav                    -0.404    0.261 -1.548 0.122 -0.915  0.107
thickness                   -0.343    0.233 -1.474 0.140 -0.799  0.113
Group Var                    0.000
species:plant_id Var         0.390    0.278
===================================================================
```

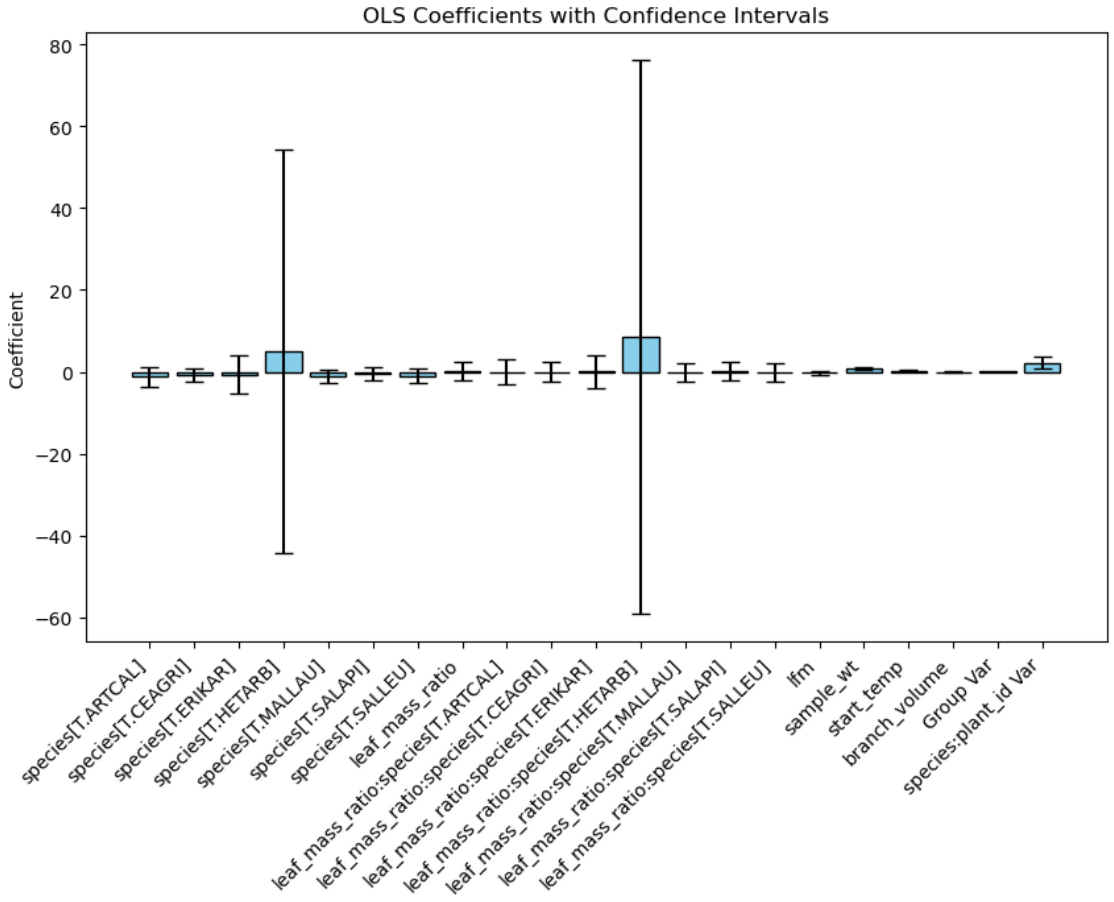


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	heat_flux_change
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.1858
Min. group size:	2	Log-Likelihood:	-144.9387
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.746	0.796	0.937	0.349	-0.815	2.307
species[T.ARTCAL]	-1.242	1.230	-1.010	0.312	-3.652	1.168
species[T.CEAGRI]	-0.806	0.871	-0.926	0.355	-2.513	0.901
species[T.ERIKAR]	-0.645	2.338	-0.276	0.783	-5.226	3.937
species[T.HETARB]	5.083	25.198	0.202	0.840	-44.303	54.470
species[T.MALLAU]	-1.084	0.870	-1.246	0.213	-2.788	0.621
species[T.SALAPI]	-0.430	0.855	-0.503	0.615	-2.105	1.245
species[T.SALLEU]	-0.957	0.874	-1.095	0.273	-2.670	0.755
leaf_mass_ratio	0.102	1.112	0.092	0.927	-2.078	2.282

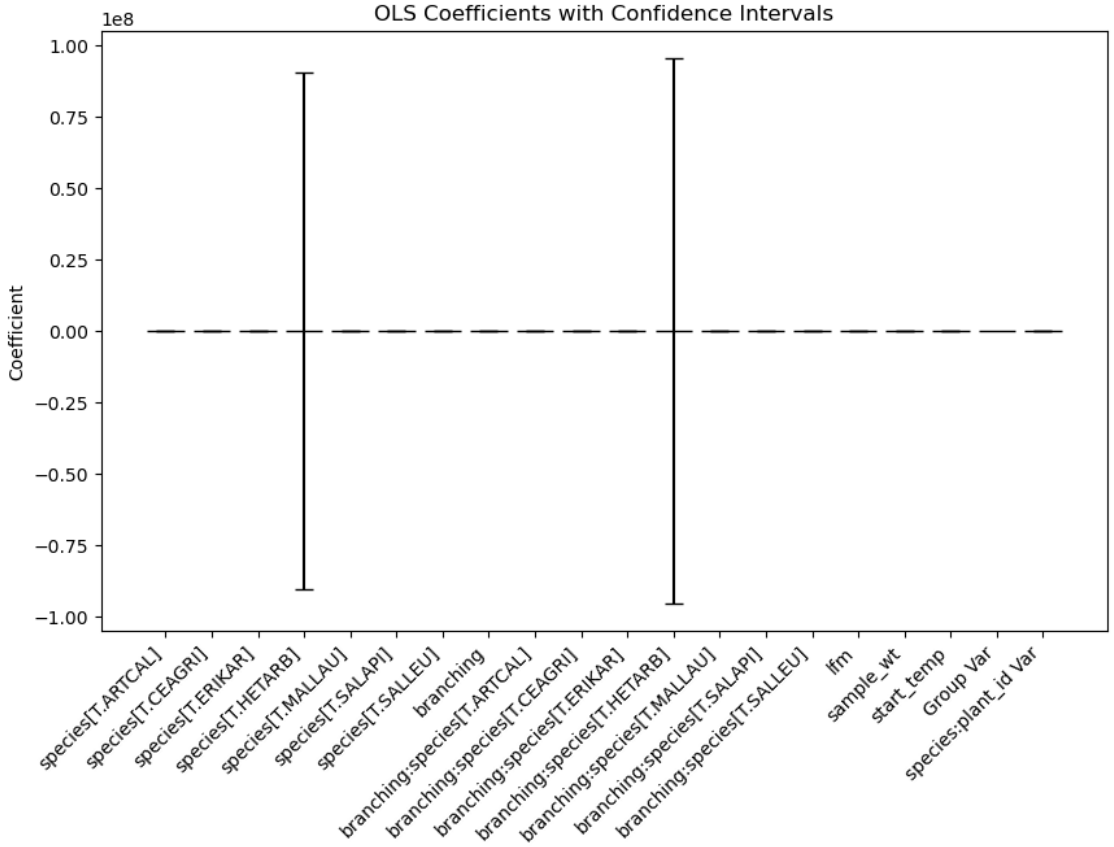
```
leaf_mass_ratio:species[T.ARTCAL] -0.127    1.563 -0.081 0.935  -3.190  2.937
leaf_mass_ratio:species[T.CEAGRI]  0.010    1.169  0.009 0.993  -2.281  2.301
leaf_mass_ratio:species[T.ERIKAR]  0.095    2.017  0.047 0.963  -3.858  4.048
leaf_mass_ratio:species[T.HETARB]  8.396   34.527  0.243 0.808 -59.276 76.068
leaf_mass_ratio:species[T.MALLAU] -0.159    1.152 -0.138 0.890  -2.417  2.099
leaf_mass_ratio:species[T.SALAPI]  0.167    1.132  0.148 0.883  -2.051  2.385
leaf_mass_ratio:species[T.SALLEU] -0.137    1.128 -0.121 0.903  -2.348  2.074
lfm                               -0.295    0.173 -1.702 0.089  -0.634  0.045
sample_wt                          0.835    0.092  9.074 0.000   0.654  1.015
start_temp                         0.283    0.069  4.114 0.000   0.148  0.417
branch_volume                     -0.132    0.086 -1.538 0.124  -0.301  0.036
Group Var                          0.010
species:plant_id Var               0.414    0.309
================================================================================
```




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

```
Model:                        MixedLM         Dependent Variable:
heat_flux_change
No. Observations:             162             Method:                      ML
No. Groups:                   8               Scale:                       0.1918
Min. group size:              2               Log-Likelihood:
-145.9455
Max. group size:              37              Converged:                   Yes
Mean group size:              20.2
--------------------------------------------------------------------------------
--------
                               Coef.    Std.Err.     z    P>|z|     [0.025
0.975]
--------------------------------------------------------------------------------
--------
Intercept                       0.607        0.433  1.402 0.161        -0.242
1.457
species[T.ARTCAL]              -1.084        0.541 -2.004 0.045        -2.144
-0.024
species[T.CEAGRI]              -0.615        0.547 -1.124 0.261        -1.686
0.457
species[T.ERIKAR]              -0.366        0.589 -0.621 0.535        -1.520
0.789
species[T.HETARB]             420.443 46194119.665  0.000 1.000 -90538390.398
90539231.283
species[T.MALLAU]              -0.991        0.517 -1.917 0.055        -2.005
0.022
species[T.SALAPI]              -0.489        0.520 -0.940 0.347        -1.507
0.530
species[T.SALLEU]              -0.770        0.542 -1.422 0.155        -1.832
0.291
branching                       0.340        0.308  1.105 0.269        -0.263
0.943
branching:species[T.ARTCAL]    -0.372        0.348 -1.069 0.285        -1.055
0.310
branching:species[T.CEAGRI]    -0.368        0.325 -1.134 0.257        -1.004
0.268
branching:species[T.ERIKAR]    -0.384        0.461 -0.832 0.405        -1.288
0.520
branching:species[T.HETARB]   444.416 48746460.156  0.000 1.000 -95540861.864
95541750.696
branching:species[T.MALLAU]    -0.457        0.352 -1.296 0.195        -1.147
0.234
branching:species[T.SALAPI]    -0.261        0.384 -0.679 0.497        -1.014
0.492
branching:species[T.SALLEU]    -0.264        0.325 -0.813 0.416        -0.901
0.373
lfm                            -0.253        0.166 -1.530 0.126        -0.578
0.071
```

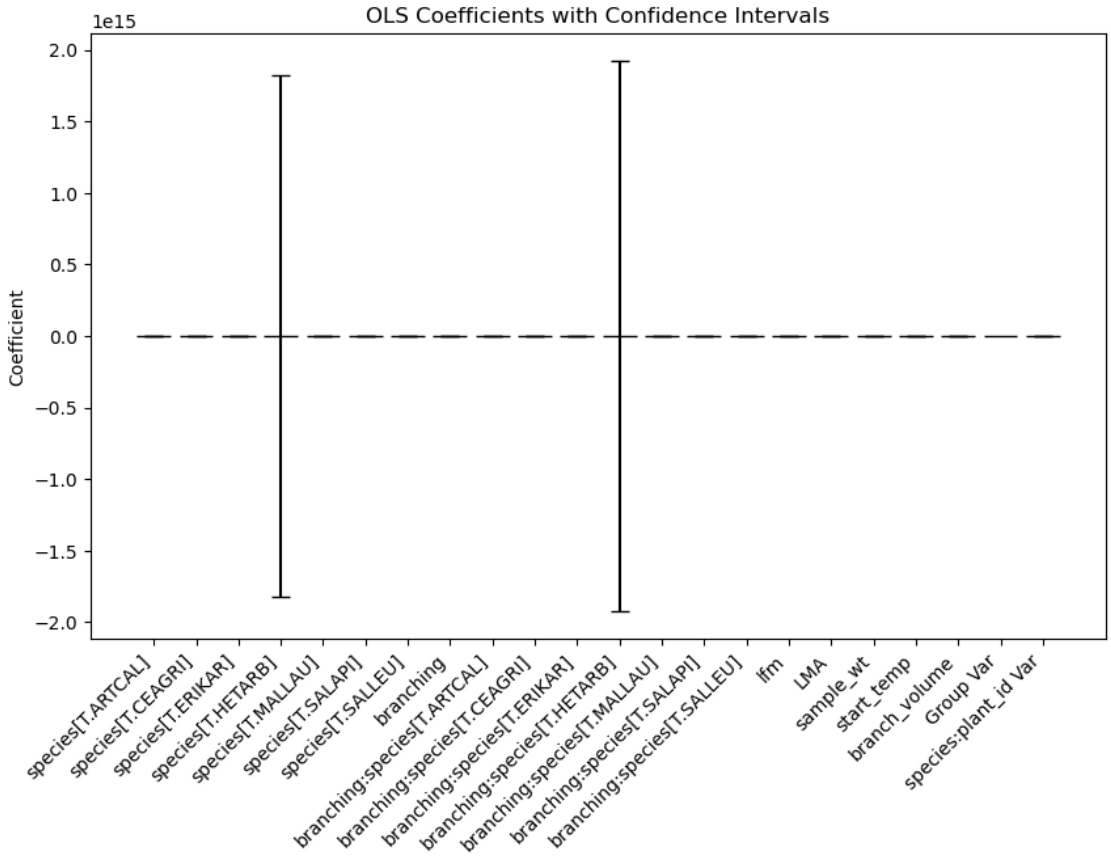
```
sample_wt                   0.727    0.070 10.351 0.000    0.590
0.865
start_temp                  0.283    0.071  3.980 0.000    0.144
0.423
Group Var                   0.008
species:plant_id Var        0.400    0.271
================================================================================
========
```




```
                          Mixed Linear Model Regression Results
================================================================================
================================
Model:                          MixedLM              Dependent Variable:
heat_flux_change
No. Observations:               162                  Method:
ML
No. Groups:                     8                    Scale:
0.1840
Min. group size:                2                    Log-Likelihood:
-144.0387
```

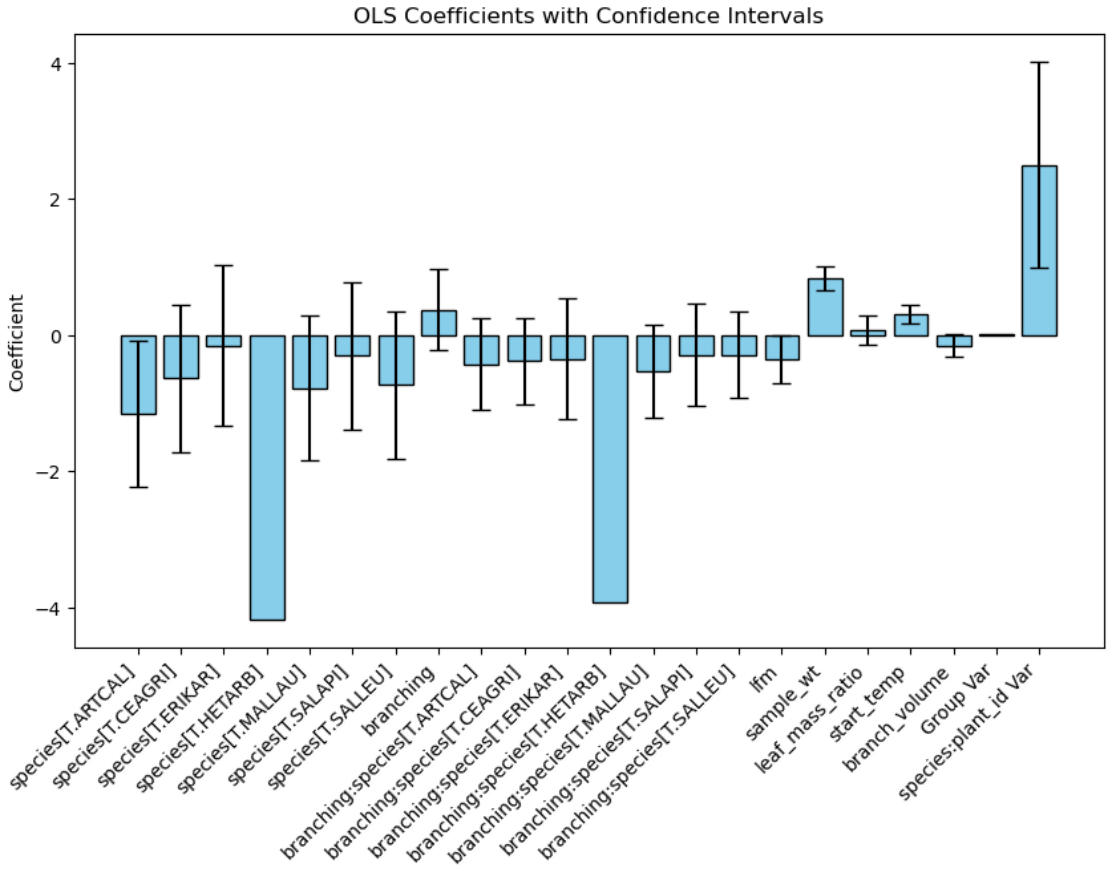
```
Max. group size:                  37                       Converged:
Yes
Mean group size:                  20.2
------------------------------------------------------------------------------
------------------------------
                             Coef.        Std.Err.        z    P>|z|
[0.025              0.975]
------------------------------------------------------------------------------
------------------------------
Intercept                     0.351
species[T.ARTCAL]            -0.736               0.578 -1.273 0.203
-1.868                0.397
species[T.CEAGRI]            -0.497               0.117 -4.262 0.000
-0.726               -0.269
species[T.ERIKAR]             0.143               0.469  0.304 0.761
-0.776                1.061
species[T.HETARB]           -23.571 929747301767910.875 -0.000 1.000
-1822271226188422.500 1822271226188375.500
species[T.MALLAU]            -0.801               0.206 -3.892 0.000
-1.204               -0.397
species[T.SALAPI]            -0.252               0.199 -1.267 0.205
-0.641                0.138
species[T.SALLEU]            -0.488               0.379 -1.287 0.198
-1.231                0.255
branching                     0.325               0.145  2.241 0.025
0.041                0.610
branching:species[T.ARTCAL]  -0.370               0.212 -1.748 0.081
-0.785                0.045
branching:species[T.CEAGRI]  -0.331               0.187 -1.765 0.078
-0.698                0.037
branching:species[T.ERIKAR]  -0.276               0.418 -0.661 0.509
-1.095                0.543
branching:species[T.HETARB] -24.341 981118162437379.125 -0.000 1.000
-1922956262955406.250 1922956262955357.750
branching:species[T.MALLAU]  -0.515               0.126 -4.099 0.000
-0.761               -0.269
branching:species[T.SALAPI]  -0.170               0.349 -0.487 0.626
-0.854                0.514
branching:species[T.SALLEU]  -0.248               0.153 -1.621 0.105
-0.548                0.052
lfm                          -0.293               0.179 -1.633 0.102
-0.644                0.059
LMA                           0.140               0.200  0.701 0.483
-0.252                0.533
sample_wt                     0.826               0.093  8.878 0.000
0.643                1.008
start_temp                    0.299               0.072  4.181 0.000
0.159                0.440
```

```
branch_volume                -0.153              0.084 -1.828 0.068
-0.318                0.011
Group Var                     0.005
species:plant_id Var          0.413              0.283
================================================================================
================================
```




```
                Mixed Linear Model Regression Results
========================================================================
Model:                MixedLM   Dependent Variable:   heat_flux_change
No. Observations:     162       Method:               ML
No. Groups:           8         Scale:                0.1789
Min. group size:      2         Log-Likelihood:       -144.0917
Max. group size:      37        Converged:            Yes
Mean group size:      20.2
------------------------------------------------------------------------
                           Coef.  Std.Err.   z    P>|z| [0.025 0.975]
------------------------------------------------------------------------
Intercept                   0.506    0.443  1.142 0.253 -0.362  1.373
```

```
species[T.ARTCAL]           -1.157    0.545 -2.122 0.034 -2.225 -0.088
species[T.CEAGRI]           -0.630    0.552 -1.140 0.254 -1.713  0.453
species[T.ERIKAR]           -0.153    0.604 -0.254 0.800 -1.337  1.030
species[T.HETARB]           -4.176
species[T.MALLAU]           -0.776    0.543 -1.430 0.153 -1.840  0.288
species[T.SALAPI]           -0.305    0.551 -0.553 0.580 -1.385  0.775
species[T.SALLEU]           -0.733    0.556 -1.318 0.187 -1.824  0.357
branching                    0.377    0.305  1.238 0.216 -0.220  0.974
branching:species[T.ARTCAL] -0.422    0.346 -1.221 0.222 -1.099  0.255
branching:species[T.CEAGRI] -0.382    0.321 -1.190 0.234 -1.010  0.247
branching:species[T.ERIKAR] -0.349    0.454 -0.768 0.442 -1.239  0.541
branching:species[T.HETARB] -3.931
branching:species[T.MALLAU] -0.528    0.349 -1.512 0.131 -1.212  0.156
branching:species[T.SALAPI] -0.286    0.381 -0.751 0.453 -1.034  0.461
branching:species[T.SALLEU] -0.289    0.321 -0.901 0.367 -0.918  0.340
lfm                         -0.361    0.178 -2.022 0.043 -0.711 -0.011
sample_wt                    0.831    0.089  9.335 0.000  0.656  1.005
leaf_mass_ratio              0.071    0.111  0.635 0.525 -0.148  0.289
start_temp                   0.305    0.070  4.356 0.000  0.168  0.442
branch_volume               -0.150    0.081 -1.864 0.062 -0.308  0.008
Group Var                    0.003
species:plant_id Var         0.447    0.327
=================================================================
```

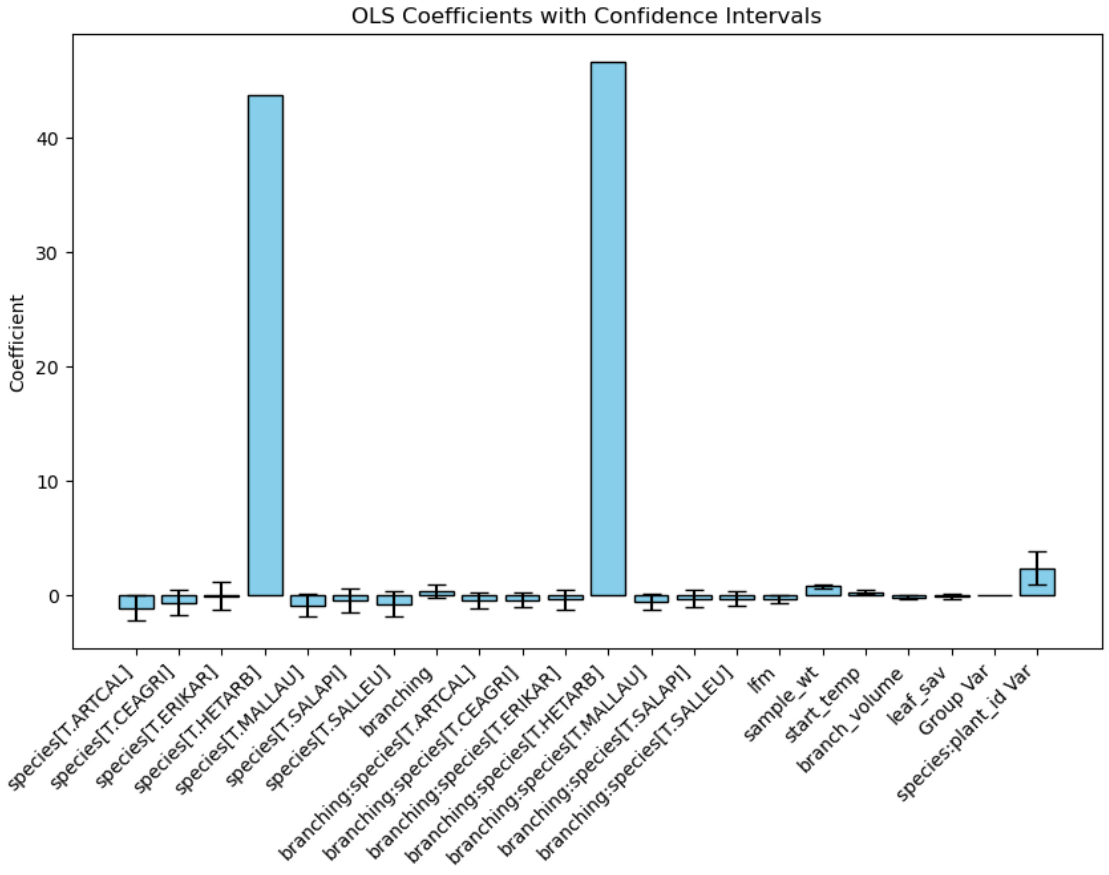


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	heat_flux_change
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.1810
Min. group size:	2	Log-Likelihood:	-144.0948
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.505	0.443	1.139	0.255	-0.364	1.374
species[T.ARTCAL]	-1.063	0.559	-1.903	0.057	-2.158	0.032
species[T.CEAGRI]	-0.624	0.550	-1.136	0.256	-1.702	0.453
species[T.ERIKAR]	-0.045	0.631	-0.072	0.943	-1.281	1.191
species[T.HETARB]	43.680					
species[T.MALLAU]	-0.834	0.522	-1.598	0.110	-1.857	0.189
species[T.SALAPI]	-0.403	0.517	-0.780	0.436	-1.417	0.611
species[T.SALLEU]	-0.740	0.555	-1.333	0.183	-1.828	0.348
branching	0.371	0.305	1.214	0.225	-0.228	0.970

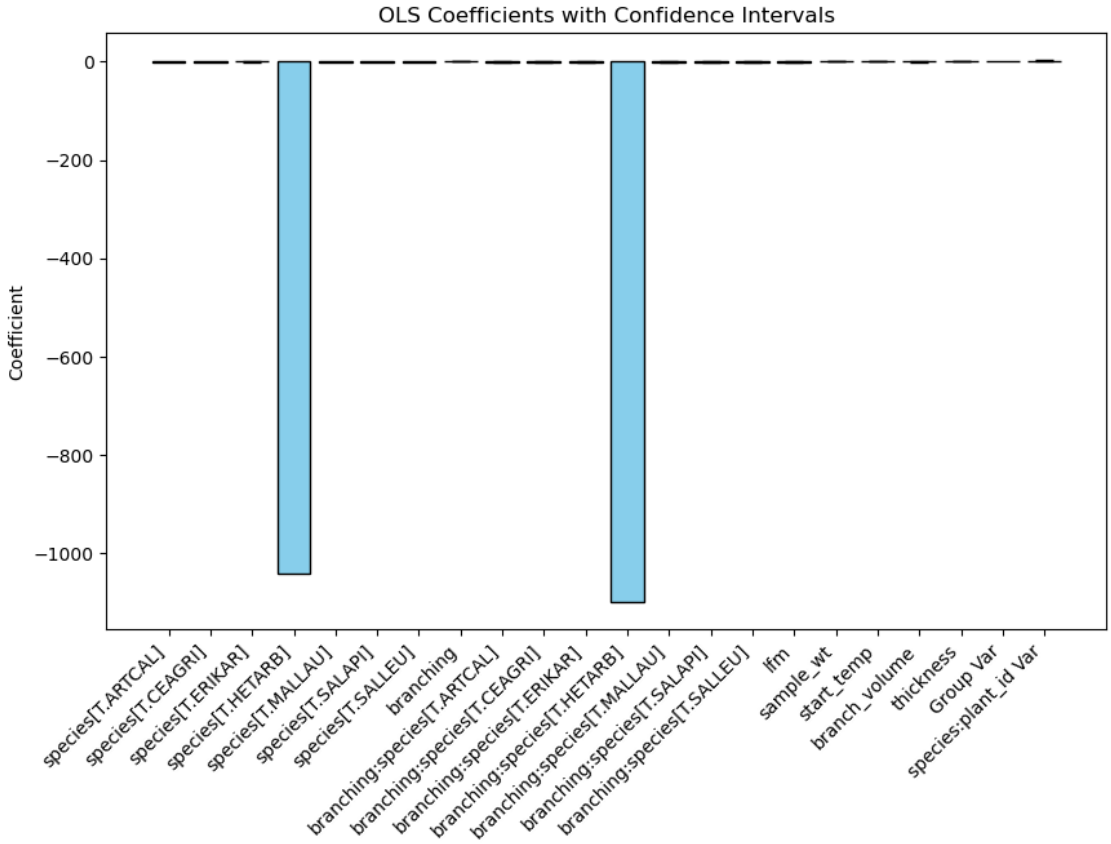
```
branching:species[T.ARTCAL] -0.423    0.346 -1.221 0.222 -1.101  0.256
branching:species[T.CEAGRI] -0.376    0.322 -1.170 0.242 -1.007  0.254
branching:species[T.ERIKAR] -0.329    0.458 -0.719 0.472 -1.227  0.568
branching:species[T.HETARB] 46.620
branching:species[T.MALLAU] -0.527    0.350 -1.507 0.132 -1.213  0.159
branching:species[T.SALAPI] -0.263    0.380 -0.691 0.489 -1.008  0.482
branching:species[T.SALLEU] -0.288    0.321 -0.897 0.370 -0.918  0.342
lfm                         -0.338    0.173 -1.950 0.051 -0.678  0.002
sample_wt                    0.819    0.089  9.228 0.000  0.645  0.993
start_temp                   0.315    0.073  4.327 0.000  0.172  0.458
branch_volume               -0.139    0.079 -1.755 0.079 -0.294  0.016
leaf_sav                    -0.051    0.109 -0.473 0.636 -0.265  0.162
Group Var                    0.002
species:plant_id Var         0.435    0.312
=================================================================
```




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

```
No. Observations:      162        Method:               ML
No. Groups:            8          Scale:                0.1829
Min. group size:       2          Log-Likelihood:       -144.1052
Max. group size:       37         Converged:            Yes
Mean group size:       20.2
```

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.564					
species[T.ARTCAL]	-1.148					
species[T.CEAGRI]	-0.670					
species[T.ERIKAR]	-0.160	0.229	-0.698	0.485	-0.608	0.289
species[T.HETARB]	-1042.762					
species[T.MALLAU]	-0.893					
species[T.SALAPI]	-0.423					
species[T.SALLEU]	-0.814					
branching	0.372	0.233	1.599	0.110	-0.084	0.827
branching:species[T.ARTCAL]	-0.416	0.273	-1.525	0.127	-0.951	0.119
branching:species[T.CEAGRI]	-0.380	0.236	-1.608	0.108	-0.842	0.083
branching:species[T.ERIKAR]	-0.344	0.497	-0.692	0.489	-1.318	0.630
branching:species[T.HETARB]	-1099.775					
branching:species[T.MALLAU]	-0.523	0.324	-1.611	0.107	-1.158	0.113
branching:species[T.SALAPI]	-0.262	0.407	-0.644	0.519	-1.061	0.536
branching:species[T.SALLEU]	-0.283	0.230	-1.232	0.218	-0.734	0.167
lfm	-0.342	0.185	-1.847	0.065	-0.705	0.021
sample_wt	0.824	0.093	8.812	0.000	0.640	1.007
start_temp	0.300	0.064	4.683	0.000	0.175	0.426
branch_volume	-0.140	0.080	-1.751	0.080	-0.298	0.017
thickness	-0.014	0.079	-0.179	0.858	-0.168	0.140
Group Var	0.001					
species:plant_id Var	0.424	0.311				

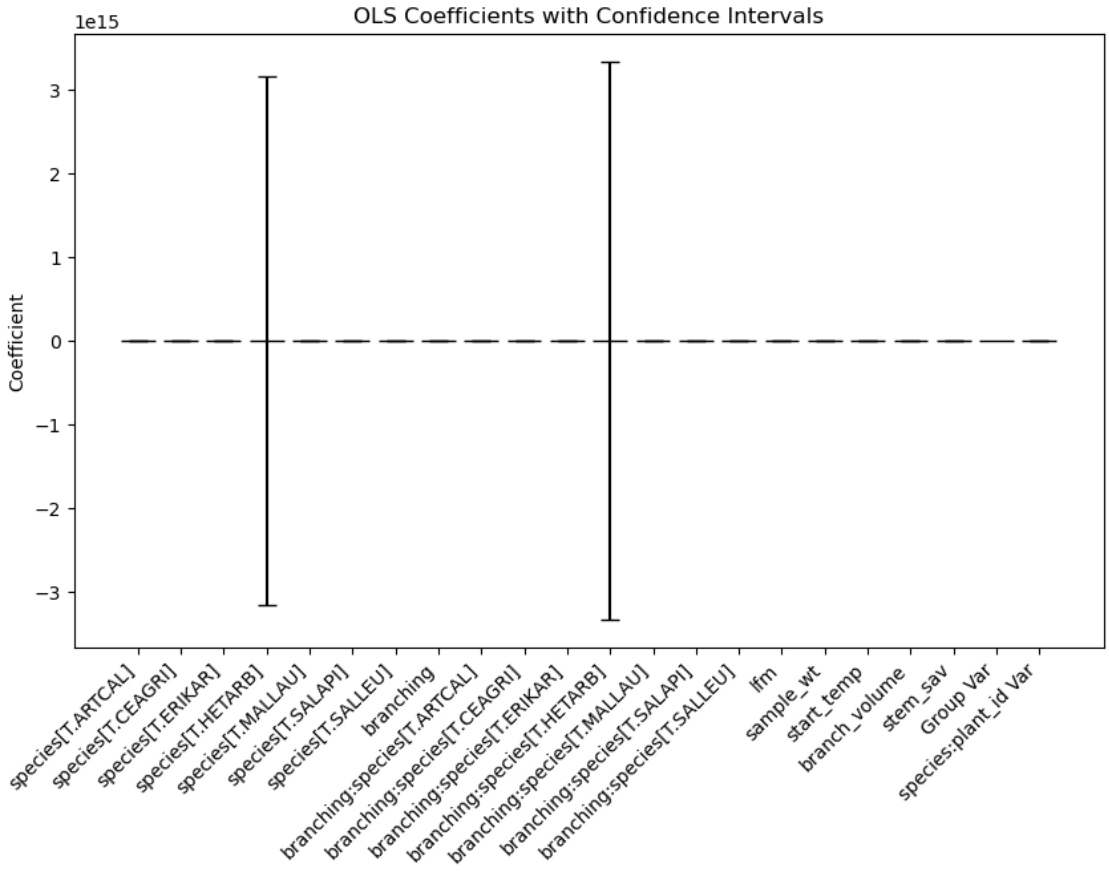


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	heat_flux_change
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.1921
Min. group size:	2	Log-Likelihood:	-144.1382
Max. group size:	37	Converged:	No
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.579	0.388	1.491	0.136		

```
-0.182                1.339
species[T.ARTCAL]            -1.122                0.468 -2.395 0.017
-2.040               -0.204
species[T.CEAGRI]            -0.643                0.548 -1.174 0.241
-1.717                0.431
species[T.ERIKAR]            -0.229                1.063 -0.215 0.830
-2.313                1.855
species[T.HETARB]           374.363 1611852003213190.250  0.000 1.000
-3159171874706218.500 3159171874706967.500
species[T.MALLAU]            -0.895                0.428 -2.093 0.036
-1.733               -0.057
species[T.SALAPI]            -0.449                0.437 -1.028 0.304
-1.305                0.407
species[T.SALLEU]            -0.795                0.498 -1.598 0.110
-1.770                0.180
branching                     0.337                0.074  4.534 0.000
0.191                0.483
branching:species[T.ARTCAL]  -0.385                0.182 -2.120 0.034
-0.741               -0.029
branching:species[T.CEAGRI]  -0.347                0.081 -4.264 0.000
-0.506               -0.187
branching:species[T.ERIKAR]  -0.303                0.455 -0.666 0.505
-1.196                0.589
branching:species[T.HETARB] 395.679 1700910852342859.750  0.000 1.000
-3333724011504936.000 3333724011505727.000
branching:species[T.MALLAU]  -0.478                0.166 -2.877 0.004
-0.803               -0.152
branching:species[T.SALAPI]  -0.243                0.232 -1.047 0.295
-0.697                0.211
branching:species[T.SALLEU]  -0.254                0.112 -2.261 0.024
-0.474               -0.034
lfm                          -0.317                0.168 -1.880 0.060
-0.647                0.013
sample_wt                     0.827                0.063 13.062 0.000
0.703                0.951
start_temp                    0.293                0.076  3.831 0.000
0.143                0.443
branch_volume                -0.139                0.078 -1.772 0.076
-0.292                0.015
stem_sav                      0.022                0.385  0.057 0.954
-0.732                0.776
Group Var                     0.001
species:plant_id Var          0.372                0.245
================================================================================
================================
```

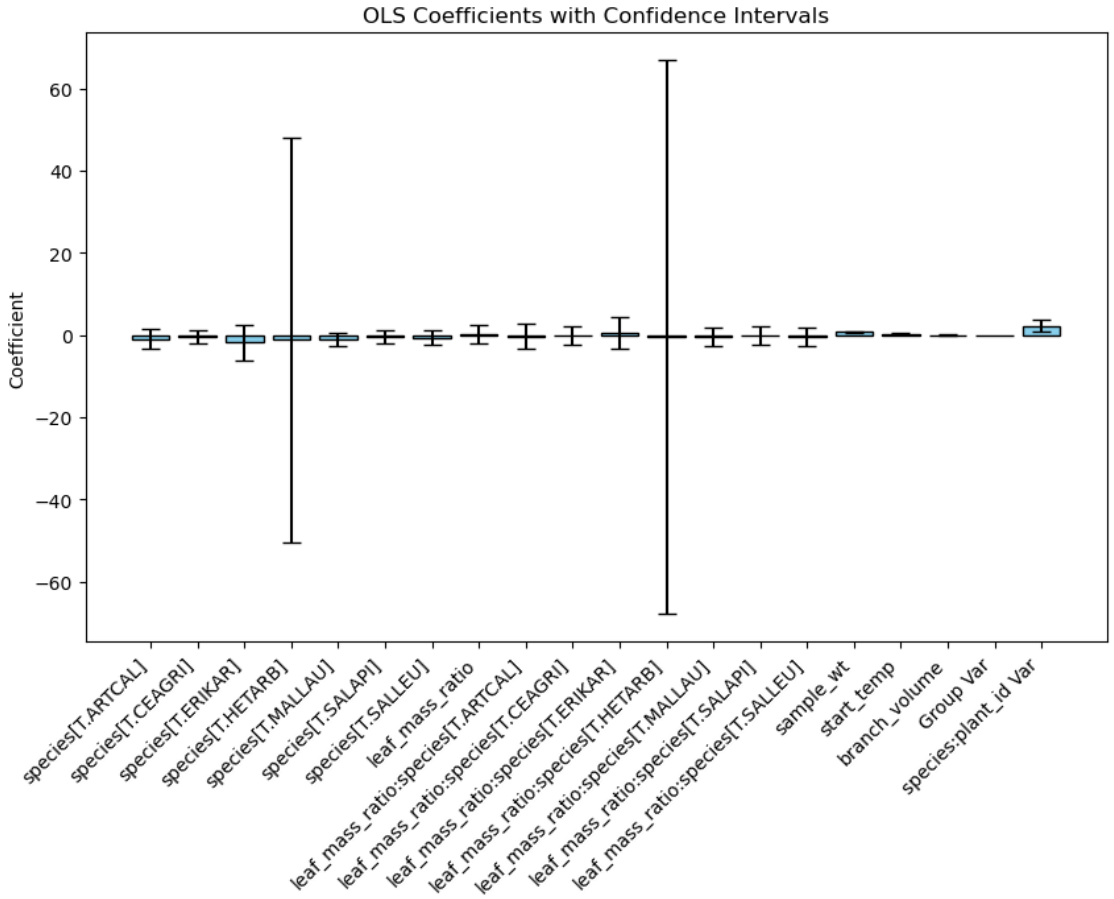


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	heat_flux_change
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.1898
Min. group size:	2	Log-Likelihood:	-146.1470
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.648	0.796	0.814	0.415	-0.912	2.208
species[T.ARTCAL]	-0.908	1.216	-0.747	0.455	-3.291	1.475
species[T.CEAGRI]	-0.482	0.848	-0.568	0.570	-2.144	1.180
species[T.ERIKAR]	-1.814	2.244	-0.808	0.419	-6.211	2.583
species[T.HETARB]	-1.206	25.092	-0.048	0.962	-50.384	47.973
species[T.MALLAU]	-1.009	0.869	-1.161	0.246	-2.713	0.695
species[T.SALAPI]	-0.452	0.854	-0.530	0.596	-2.126	1.221
species[T.SALLEU]	-0.629	0.851	-0.739	0.460	-2.297	1.039
leaf_mass_ratio	0.276	1.115	0.247	0.805	-1.909	2.461

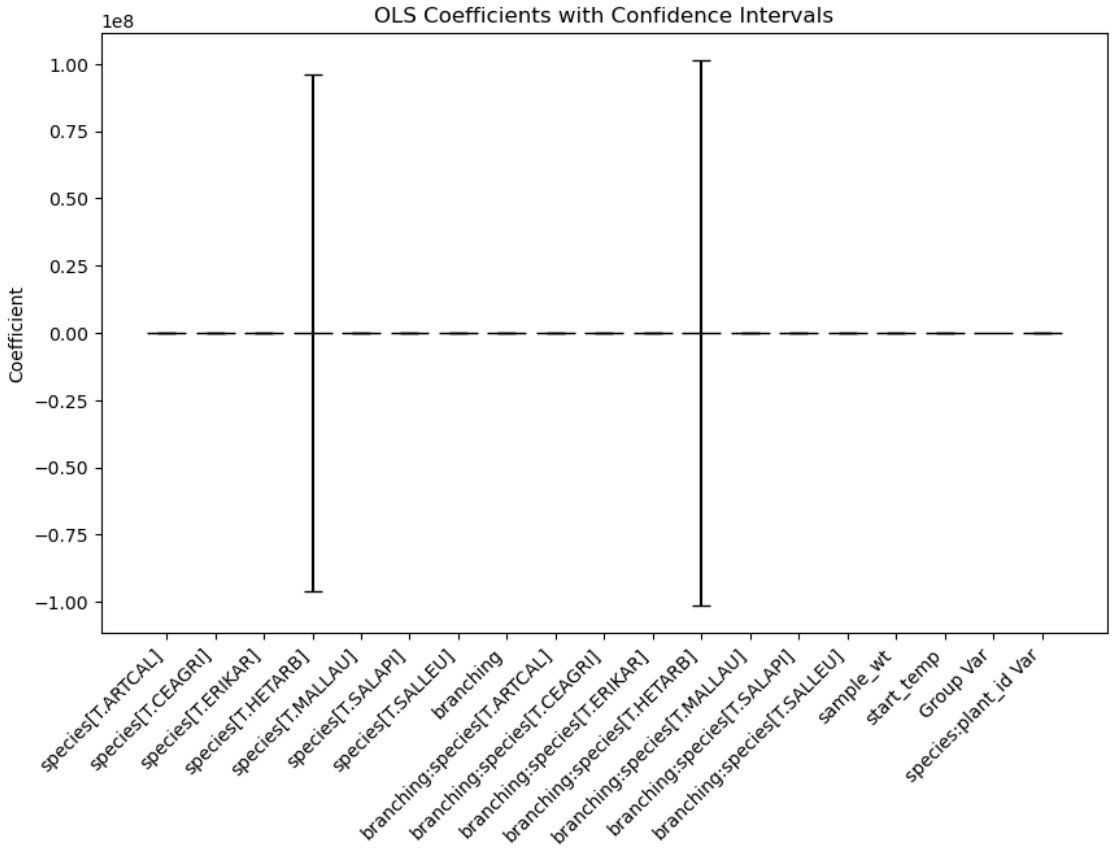
```
leaf_mass_ratio:species[T.ARTCAL] -0.332    1.568 -0.212 0.832  -3.405  2.740
leaf_mass_ratio:species[T.CEAGRI] -0.180    1.171 -0.153 0.878  -2.475  2.115
leaf_mass_ratio:species[T.ERIKAR]  0.612    2.005  0.305 0.760  -3.318  4.542
leaf_mass_ratio:species[T.HETARB] -0.572   34.350 -0.017 0.987 -67.897 66.753
leaf_mass_ratio:species[T.MALLAU] -0.346    1.155 -0.300 0.765  -2.609  1.917
leaf_mass_ratio:species[T.SALAPI] -0.017    1.133 -0.015 0.988  -2.238  2.204
leaf_mass_ratio:species[T.SALLEU] -0.370    1.127 -0.328 0.743  -2.578  1.839
sample_wt                          0.831    0.093  8.913 0.000   0.648  1.013
start_temp                         0.281    0.070  4.008 0.000   0.143  0.418
branch_volume                     -0.091    0.083 -1.091 0.275  -0.255  0.073
Group Var                          0.005
species:plant_id Var               0.418    0.317
================================================================================
```




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

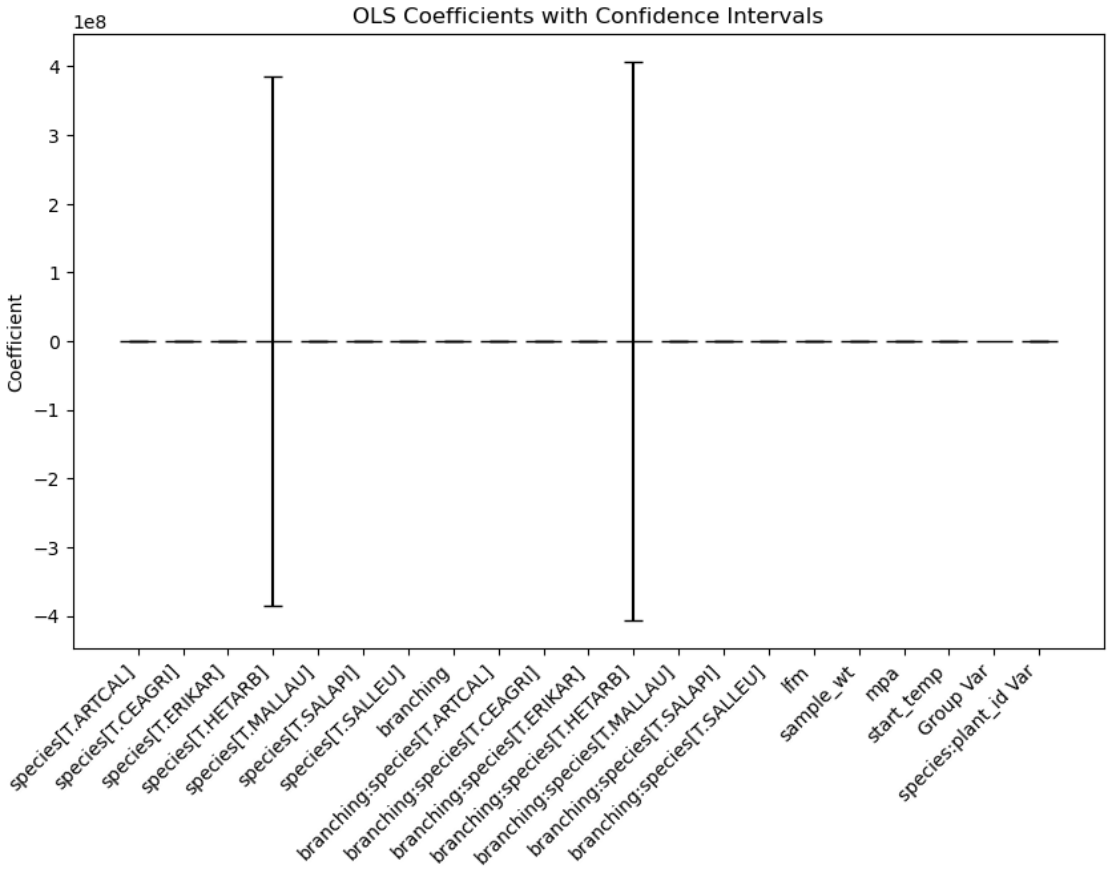
```
heat_flux_change
No. Observations:           162             Method:                       ML
No. Groups:                 8               Scale:                        0.1932
Min. group size:            2               Log-Likelihood:
-147.1652
Max. group size:            37              Converged:                    No
Mean group size:            20.2
------------------------------------------------------------------------------
----------
                             Coef.    Std.Err.     z    P>|z|     [0.025
0.975]
------------------------------------------------------------------------------
----------
Intercept                     0.600        0.439  1.367 0.172         -0.260
1.460
species[T.ARTCAL]            -0.904        0.535 -1.691 0.091         -1.953
0.144
species[T.CEAGRI]            -0.412        0.538 -0.766 0.443         -1.467
0.642
species[T.ERIKAR]            -0.663        0.563 -1.178 0.239         -1.766
0.440
species[T.HETARB]           -56.652 48979566.648 -0.000 1.000  -95998243.260
95998129.956
species[T.MALLAU]            -0.955        0.523 -1.824 0.068         -1.981
0.071
species[T.SALAPI]            -0.546        0.524 -1.042 0.297         -1.573
0.481
species[T.SALLEU]            -0.534        0.528 -1.011 0.312         -1.569
0.501
branching                     0.352        0.310  1.136 0.256         -0.256
0.960
branching:species[T.ARTCAL]  -0.379        0.351 -1.081 0.280         -1.067
0.309
branching:species[T.CEAGRI]  -0.381        0.327 -1.164 0.244         -1.022
0.260
branching:species[T.ERIKAR]  -0.339        0.464 -0.731 0.465         -1.250
0.571
branching:species[T.HETARB] -59.111 51685810.042 -0.000 1.000 -101302385.306
101302267.083
branching:species[T.MALLAU]  -0.412        0.353 -1.170 0.242         -1.104
0.279
branching:species[T.SALAPI]  -0.199        0.386 -0.516 0.606         -0.955
0.557
branching:species[T.SALLEU]  -0.295        0.327 -0.901 0.368         -0.936
0.347
sample_wt                     0.749        0.069 10.879 0.000          0.614
0.884
start_temp                    0.284        0.072  3.968 0.000          0.144
```

```
0.424
Group Var                    0.009
species:plant_id Var         0.414        0.282
================================================================================
==========
```




```
                          Mixed Linear Model Regression Results
================================================================================
==========
Model:                      MixedLM          Dependent Variable:
heat_flux_change
No. Observations:           162              Method:                         ML
No. Groups:                 8                Scale:                          0.1857
Min. group size:            2                Log-Likelihood:
-145.2617
Max. group size:            37               Converged:                      No
Mean group size:            20.2
--------------------------------------------------------------------------------
----------
                            Coef.     Std.Err.     z     P>|z|      [0.025
```

```
0.975]
------------------------------------------------------------------------------
----------
Intercept                     0.618         0.434  1.423 0.155         -0.233
1.469
species[T.ARTCAL]            -1.106         0.541 -2.044 0.041         -2.167
-0.046
species[T.CEAGRI]            -0.701         0.553 -1.267 0.205         -1.785
0.384
species[T.ERIKAR]            -0.362         0.589 -0.615 0.539         -1.516
0.792
species[T.HETARB]            38.706 196521801.845  0.000 1.000 -385175615.088
385175692.499
species[T.MALLAU]            -0.980         0.516 -1.900 0.057         -1.990
0.031
species[T.SALAPI]            -0.465         0.519 -0.896 0.371         -1.482
0.552
species[T.SALLEU]            -0.749         0.543 -1.380 0.168         -1.814
0.315
branching                     0.379         0.308  1.231 0.218         -0.224
0.982
branching:species[T.ARTCAL] -0.391         0.347 -1.125 0.260         -1.072
0.290
branching:species[T.CEAGRI] -0.438         0.328 -1.334 0.182         -1.081
0.205
branching:species[T.ERIKAR] -0.415         0.459 -0.905 0.365         -1.314
0.484
branching:species[T.HETARB] 41.515 207380122.253  0.000 1.000 -406457529.211
406457612.241
branching:species[T.MALLAU] -0.499         0.352 -1.420 0.156         -1.188
0.190
branching:species[T.SALAPI] -0.314         0.385 -0.815 0.415         -1.070
0.441
branching:species[T.SALLEU] -0.304         0.325 -0.937 0.349         -0.941
0.332
lfm                          -0.254         0.167 -1.518 0.129         -0.581
0.074
sample_wt                     0.739         0.071 10.461 0.000          0.601
0.877
mpa                           0.070         0.067  1.037 0.300         -0.062
0.202
start_temp                    0.292         0.070  4.150 0.000          0.154
0.431
Group Var                     0.004
species:plant_id Var          0.426         0.295
==============================================================================
==========
```

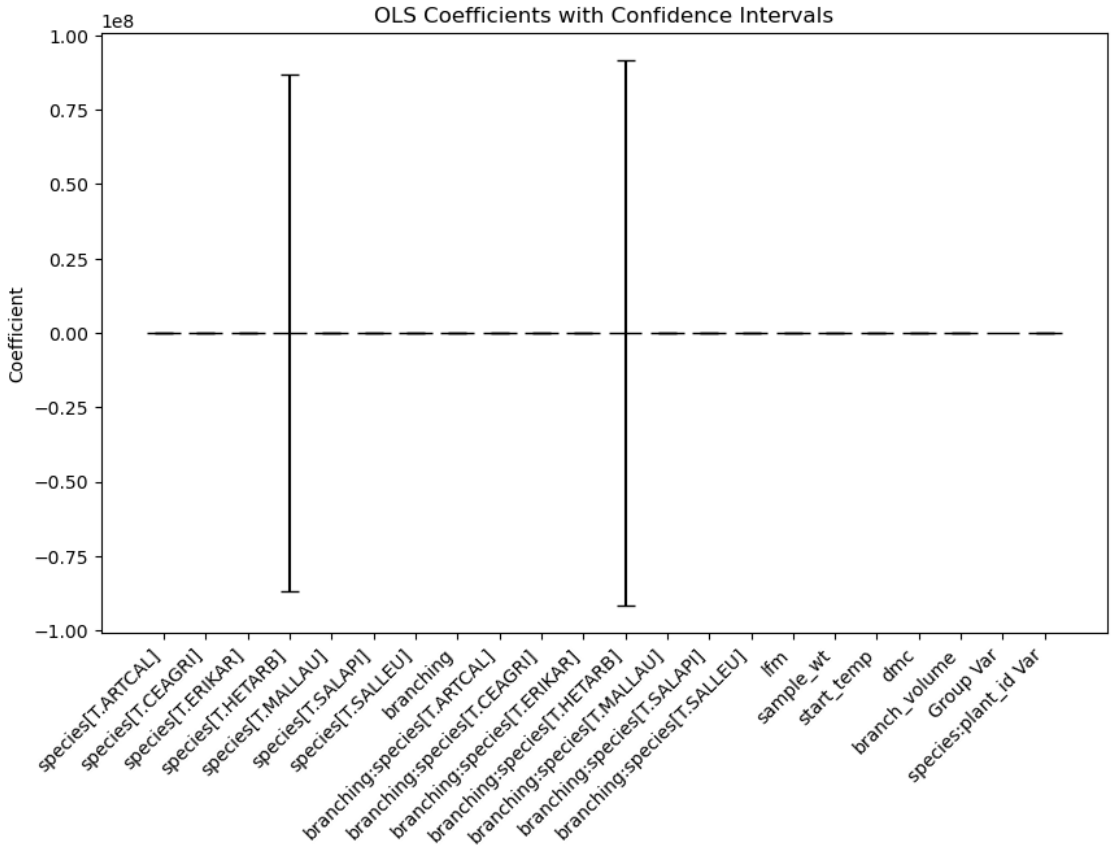


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	heat_flux_change
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.1839
Min. group size:	2	Log-Likelihood:	-144.2667
Max. group size:	37	Converged:	Yes
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.547	0.436	1.255	0.210	-0.307	1.402
species[T.ARTCAL]	-1.133	0.539	-2.101	0.036	-2.191	-0.076

```
species[T.CEAGRI]           -0.654        0.544 -1.202 0.230        -1.720
0.412
species[T.ERIKAR]           -0.141        0.601 -0.235 0.814        -1.319
1.037
species[T.HETARB]            0.972 44279818.037  0.000 1.000 -86786847.622
86786849.566
species[T.MALLAU]           -0.871        0.519 -1.678 0.093        -1.889
0.146
species[T.SALAPI]           -0.411        0.528 -0.778 0.436        -1.445
0.623
species[T.SALLEU]           -0.783        0.553 -1.415 0.157        -1.867
0.301
branching                    0.364        0.305  1.193 0.233        -0.234
0.963
branching:species[T.ARTCAL] -0.410        0.346 -1.185 0.236        -1.089
0.268
branching:species[T.CEAGRI] -0.372        0.322 -1.158 0.247        -1.003
0.258
branching:species[T.ERIKAR] -0.336        0.457 -0.735 0.462        -1.232
0.560
branching:species[T.HETARB]  1.607 46726388.582  0.000 1.000 -91582037.141
91582040.355
branching:species[T.MALLAU] -0.517        0.350 -1.477 0.140        -1.204
0.169
branching:species[T.SALAPI] -0.262        0.381 -0.687 0.492        -1.008
0.485
branching:species[T.SALLEU] -0.279        0.322 -0.866 0.386        -0.909
0.352
lfm                         -0.344        0.187 -1.838 0.066        -0.711
0.023
sample_wt                    0.825        0.089  9.245 0.000         0.650
0.999
start_temp                   0.301        0.071  4.225 0.000         0.162
0.441
dmc                         -0.013        0.093 -0.138 0.890        -0.196
0.170
branch_volume               -0.140        0.080 -1.760 0.078        -0.297
0.016
Group Var                    0.004
species:plant_id Var         0.418        0.292
================================================================================
=======
```

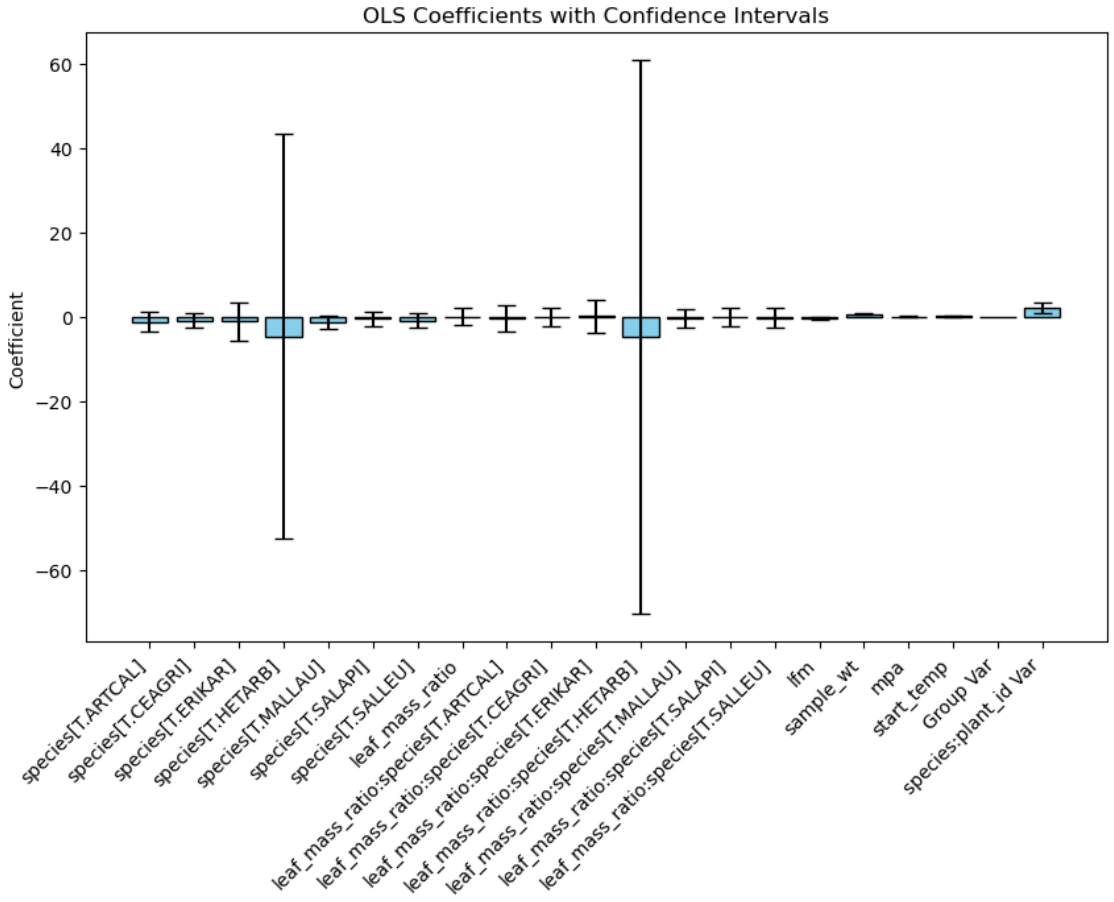


Mixed Linear Model Regression Results

Model:	MixedLM	Dependent Variable:	heat_flux_change
No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.1894
Min. group size:	2	Log-Likelihood:	-145.2987
Max. group size:	37	Converged:	No
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.781	0.790	0.988	0.323	-0.767	2.329
species[T.ARTCAL]	-1.125	1.216	-0.925	0.355	-3.509	1.258
species[T.CEAGRI]	-0.860	0.868	-0.991	0.322	-2.562	0.842
species[T.ERIKAR]	-0.990	2.316	-0.427	0.669	-5.528	3.549
species[T.HETARB]	-4.608	24.421	-0.189	0.850	-52.473	43.256
species[T.MALLAU]	-1.266	0.851	-1.488	0.137	-2.934	0.402
species[T.SALAPI]	-0.458	0.842	-0.545	0.586	-2.108	1.191
species[T.SALLEU]	-0.889	0.860	-1.033	0.301	-2.574	0.797
leaf_mass_ratio	0.140	1.109	0.126	0.900	-2.034	2.314

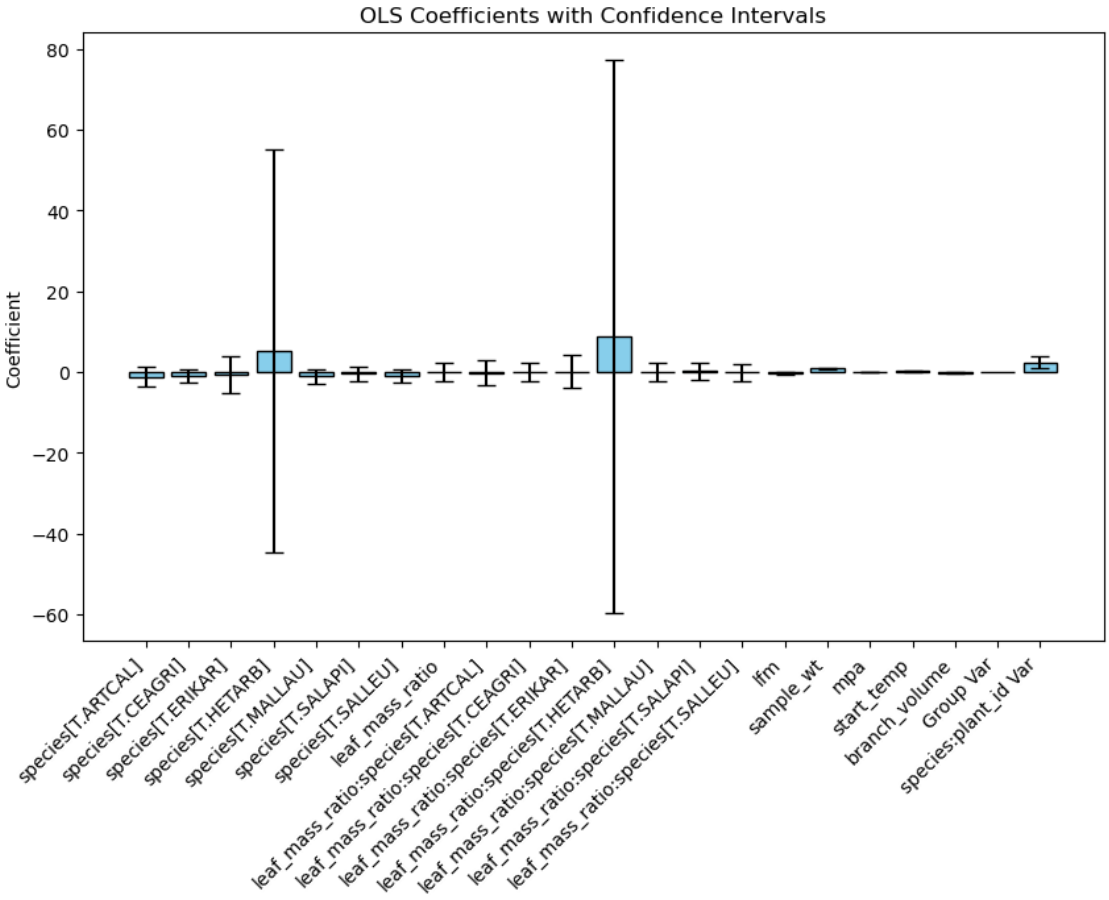
```
leaf_mass_ratio:species[T.ARTCAL] -0.263    1.558 -0.169 0.866  -3.316  2.789
leaf_mass_ratio:species[T.CEAGRI] -0.057    1.165 -0.049 0.961  -2.340  2.226
leaf_mass_ratio:species[T.ERIKAR]  0.219    2.008  0.109 0.913  -3.716  4.154
leaf_mass_ratio:species[T.HETARB] -4.845   33.465 -0.145 0.885 -70.435 60.744
leaf_mass_ratio:species[T.MALLAU] -0.348    1.141 -0.305 0.760  -2.585  1.889
leaf_mass_ratio:species[T.SALAPI]  0.095    1.127  0.085 0.933  -2.114  2.305
leaf_mass_ratio:species[T.SALLEU] -0.173    1.125 -0.154 0.878  -2.379  2.032
lfm                               -0.215    0.165 -1.305 0.192  -0.539  0.108
sample_wt                          0.748    0.070 10.737 0.000   0.612  0.885
mpa                                0.054    0.065  0.838 0.402  -0.073  0.182
start_temp                         0.279    0.069  4.040 0.000   0.144  0.415
Group Var                          0.001
species:plant_id Var               0.407    0.303
================================================================================
```




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

No. Observations:	162	Method:	ML
No. Groups:	8	Scale:	0.1810
Min. group size:	2	Log-Likelihood:	-144.3108
Max. group size:	37	Converged:	No
Mean group size:	20.2		

	Coef.	Std.Err.	z	P>|z|	[0.025	0.975]
Intercept	0.795	0.806	0.986	0.324	-0.785	2.376
species[T.ARTCAL]	-1.244	1.245	-0.999	0.318	-3.685	1.196
species[T.CEAGRI]	-0.962	0.891	-1.079	0.280	-2.708	0.784
species[T.ERIKAR]	-0.678	2.378	-0.285	0.775	-5.340	3.983
species[T.HETARB]	5.267	25.497	0.207	0.836	-44.706	55.240
species[T.MALLAU]	-1.087	0.877	-1.241	0.215	-2.805	0.631
species[T.SALAPI]	-0.427	0.862	-0.495	0.621	-2.116	1.263
species[T.SALLEU]	-0.973	0.882	-1.103	0.270	-2.702	0.756
leaf_mass_ratio	0.071	1.127	0.063	0.950	-2.139	2.281
leaf_mass_ratio:species[T.ARTCAL]	-0.176	1.588	-0.111	0.912	-3.289	2.937
leaf_mass_ratio:species[T.CEAGRI]	0.029	1.185	0.025	0.980	-2.294	2.352
leaf_mass_ratio:species[T.ERIKAR]	0.126	2.052	0.062	0.951	-3.895	4.148
leaf_mass_ratio:species[T.HETARB]	8.683	34.938	0.249	0.804	-59.794	77.160
leaf_mass_ratio:species[T.MALLAU]	-0.106	1.167	-0.091	0.928	-2.392	2.181
leaf_mass_ratio:species[T.SALAPI]	0.210	1.147	0.183	0.854	-2.037	2.458
leaf_mass_ratio:species[T.SALLEU]	-0.087	1.143	-0.076	0.939	-2.327	2.153
lfm	-0.302	0.175	-1.727	0.084	-0.644	0.041
sample_wt	0.852	0.093	9.193	0.000	0.670	1.033
mpa	0.066	0.064	1.029	0.303	-0.060	0.192
start_temp	0.293	0.068	4.284	0.000	0.159	0.427
branch_volume	-0.143	0.086	-1.667	0.095	-0.311	0.025
Group Var	0.007					
species:plant_id Var	0.435	0.328				


OLS Coefficients with Confidence Intervals
Coefficient
80
60
40
20
0
−20
−40
−60
species[T.ARTCAL]
species[T.CEAGRI]
species[T.ERIKAR]
species[T.HETARB]
species[T.MALLAU]
species[T.SALAPI]
species[T.SALLEU]
leaf_mass_ratio
leaf_mass_ratio:species[T.ARTCAL]
leaf_mass_ratio:species[T.CEAGRI]
leaf_mass_ratio:species[T.ERIKAR]
leaf_mass_ratio:species[T.HETARB]
leaf_mass_ratio:species[T.MALLAU]
leaf_mass_ratio:species[T.SALAPI]
leaf_mass_ratio:species[T.SALLEU]
lfm
sample_wt
mpa
start_temp
branch_volume
Group Var
species:plant_id Var