```
from __future__ import print_function
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.metrics import classification_report
from sklearn import metrics
from sklearn import tree
import warnings
warnings.filterwarnings('ignore')
```

```
crop=pd.read_csv('/content/csv.csv')
```

```
crop.head()
```

	Nitrogen	potassium	phosphorus	temperature	humidity	ph	rainfall	label
0	90	42	43	20.879744	82.002744	6.502985	202.935536	rice
1	85	58	41	21.770462	80.319644	7.038096	226.655537	rice
2	60	55	44	23.004459	82.320763	7.840207	263.964248	rice
3	74	35	40	26.491096	80.158363	6.980401	242.864034	rice
4	78	42	42	20.130175	81.604873	7.628473	262.717340	rice

```
crop.tail()
```

	Nitrogen	potassium	phosphorus	temperature	humidity	ph	rainfall	label
2195	107	34	32	26.774637	66.413269	6.780064	177.774507	coffee
2196	99	15	27	27.417112	56.636362	6.086922	127.924610	coffee
2197	118	33	30	24.131797	67.225123	6.362608	173.322839	coffee
2198	117	32	34	26.272418	52.127394	6.758793	127.175293	coffee
2199	104	18	30	23.603016	60.396475	6.779833	140.937041	coffee

```
crop.size
crop.shape
```

```
(2200, 8)
```

```
crop.columns
```

```
Index(['Nitrogen', 'potassium', 'phosphorus', 'temperature', 'humidity', 'ph',
       'rainfall', 'label'],
      dtype='object')
```

```
crop['label'].unique()
```

```
array(['rice', 'maize', 'chickpea', 'kidneybeans', 'pigeonpeas',
       'mothbeans', 'mungbean', 'blackgram', 'lentil', 'pomegranate',
       'banana', 'mango', 'grapes', 'watermelon', 'muskmelon', 'apple',
       'orange', 'papaya', 'coconut', 'cotton', 'jute', 'coffee'],
      dtype=object)
```

```
crop.dtypes
```

```
Nitrogen         int64
potassium        int64
phosphorus       int64
temperature    float64
humidity       float64
ph             float64
rainfall       float64
label           object
dtype: object
```

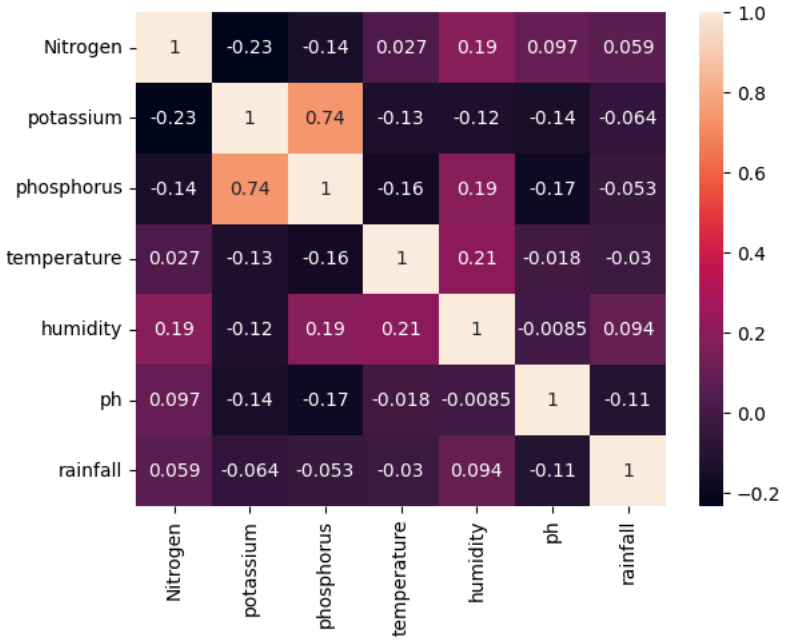
```
crop['label'].value_counts()
```

```
rice           100
maize          100
```

```
jute           100
cotton         100
coconut        100
papaya         100
orange         100
apple          100
muskmelon      100
watermelon     100
grapes         100
mango          100
banana         100
pomegranate    100
lentil         100
blackgram      100
mungbean       100
mothbeans      100
pigeonpeas     100
kidneybeans    100
chickpea       100
coffee         100
Name: label, dtype: int64
```

```
sns.heatmap(crop.corr(),annot=True)
```

```
<Axes: >
```




```
features = crop[['Nitrogen', 'potassium','phosphorus','temperature', 'humidity', 'ph', 'rainfall']]
target = crop['label']
labels = crop['label']

acc = []
model = []


from sklearn.model_selection import train_test_split
Xtrain, Xtest, Ytrain, Ytest = train_test_split(features,target,test_size = 0.2,random_state =2)


from sklearn.tree import DecisionTreeClassifier

DecisionTree = DecisionTreeClassifier(criterion="entropy",random_state=2,max_depth=5)

DecisionTree.fit(Xtrain,Ytrain)

predicted_values = DecisionTree.predict(Xtest)
x = metrics.accuracy_score(Ytest, predicted_values)
acc.append(x)
model.append('Decision Tree')
print("DecisionTrees's Accuracy is: ", x*100)

print(classification_report(Ytest,predicted_values))
```

```
DecisionTrees's Accuracy is:  90.0
              precision    recall  f1-score   support

       apple       1.00      1.00      1.00        13
```

```
           banana       1.00      1.00      1.00        17
        blackgram       0.59      1.00      0.74        16
         chickpea       1.00      1.00      1.00        21
          coconut       0.91      1.00      0.95        21
           coffee       1.00      1.00      1.00        22
           cotton       1.00      1.00      1.00        20
           grapes       1.00      1.00      1.00        18
             jute       0.74      0.93      0.83        28
      kidneybeans       0.00      0.00      0.00        14
           lentil       0.68      1.00      0.81        23
            maize       1.00      1.00      1.00        21
            mango       1.00      1.00      1.00        26
        mothbeans       0.00      0.00      0.00        19
         mungbean       1.00      1.00      1.00        24
        muskmelon       1.00      1.00      1.00        23
           orange       1.00      1.00      1.00        29
           papaya       1.00      0.84      0.91        19
       pigeonpeas       0.62      1.00      0.77        18
      pomegranate       1.00      1.00      1.00        17
             rice       1.00      0.62      0.77        16
       watermelon       1.00      1.00      1.00        15

         accuracy                           0.90       440
        macro avg       0.84      0.88      0.85       440
     weighted avg       0.86      0.90      0.87       440
```

```
from sklearn.ensemble import RandomForestClassifier

RF = RandomForestClassifier(n_estimators=20, random_state=0)
RF.fit(Xtrain,Ytrain)

predicted_values = RF.predict(Xtest)

x = metrics.accuracy_score(Ytest, predicted_values)
acc.append(x)
model.append('RF')
print("RF's Accuracy is: ", x)

print(classification_report(Ytest,predicted_values))
```

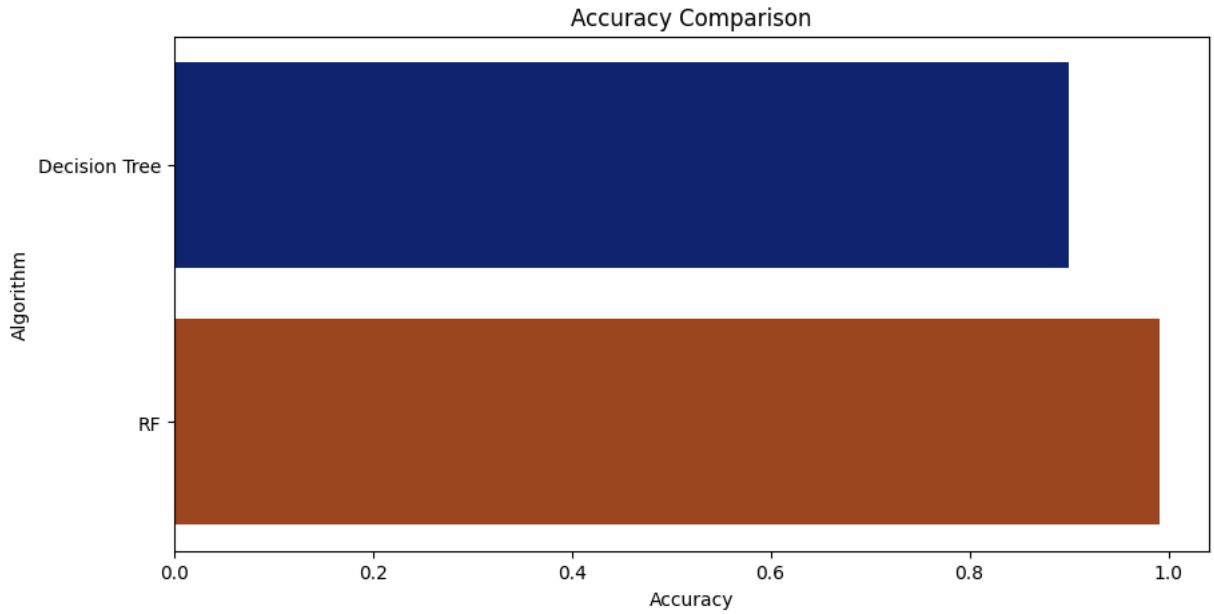
```
     RF's Accuracy is:  0.990909090909091
                   precision    recall  f1-score   support

            apple       1.00      1.00      1.00        13
           banana       1.00      1.00      1.00        17
        blackgram       0.94      1.00      0.97        16
         chickpea       1.00      1.00      1.00        21
          coconut       1.00      1.00      1.00        21
           coffee       1.00      1.00      1.00        22
           cotton       1.00      1.00      1.00        20
           grapes       1.00      1.00      1.00        18
             jute       0.90      1.00      0.95        28
      kidneybeans       1.00      1.00      1.00        14
           lentil       1.00      1.00      1.00        23
            maize       1.00      1.00      1.00        21
            mango       1.00      1.00      1.00        26
        mothbeans       1.00      0.95      0.97        19
         mungbean       1.00      1.00      1.00        24
        muskmelon       1.00      1.00      1.00        23
           orange       1.00      1.00      1.00        29
           papaya       1.00      1.00      1.00        19
       pigeonpeas       1.00      1.00      1.00        18
      pomegranate       1.00      1.00      1.00        17
             rice       1.00      0.81      0.90        16
       watermelon       1.00      1.00      1.00        15

         accuracy                           0.99       440
        macro avg       0.99      0.99      0.99       440
     weighted avg       0.99      0.99      0.99       440
```

```
plt.figure(figsize=[10,5],dpi = 100)
plt.title('Accuracy Comparison')
plt.xlabel('Accuracy')
plt.ylabel('Algorithm')
sns.barplot(x = acc,y = model,palette='dark')
```

```
<Axes: title={'center': 'Accuracy Comparison'}, xlabel='Accuracy', ylabel='Algorithm'>
```




```
accuracy_models = dict(zip(model, acc))
for k, v in accuracy_models.items():
    print (k, '-->', v)
```

```
Decision Tree --> 0.9
RF --> 0.990909090909091
```

```
data = np.array([[104,18, 30, 23.603016, 60.3, 6.7, 140.91]])
prediction = RF.predict(data)
print(prediction)
```

```
['coffee']
```