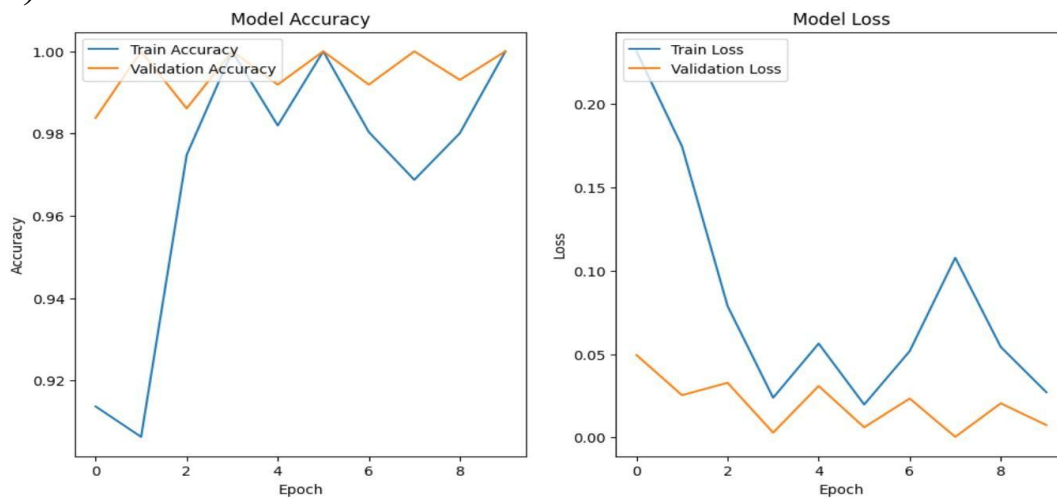# Coconut tree disease classification
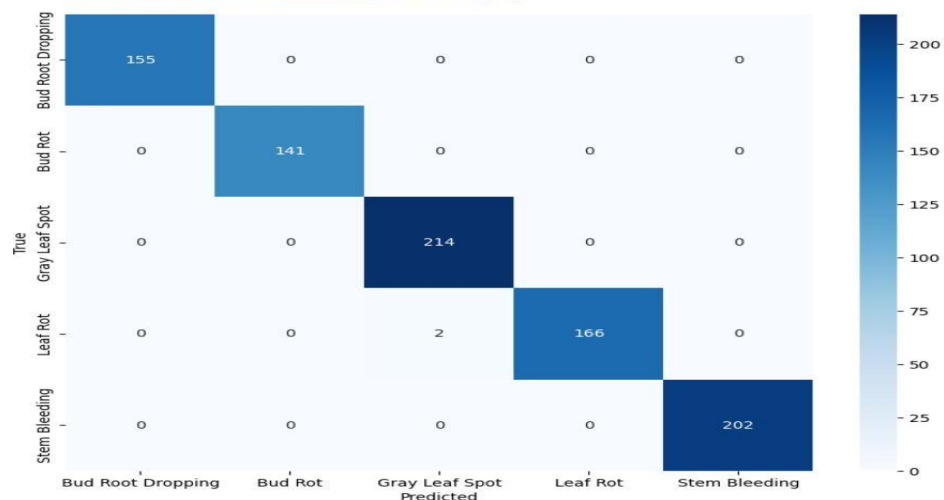
Murarisetty V Sai Kartheek Desai Varun Prasad
CH.EN.U4CCE22019 CH.EN.U4CCE22009

Densenet 201:

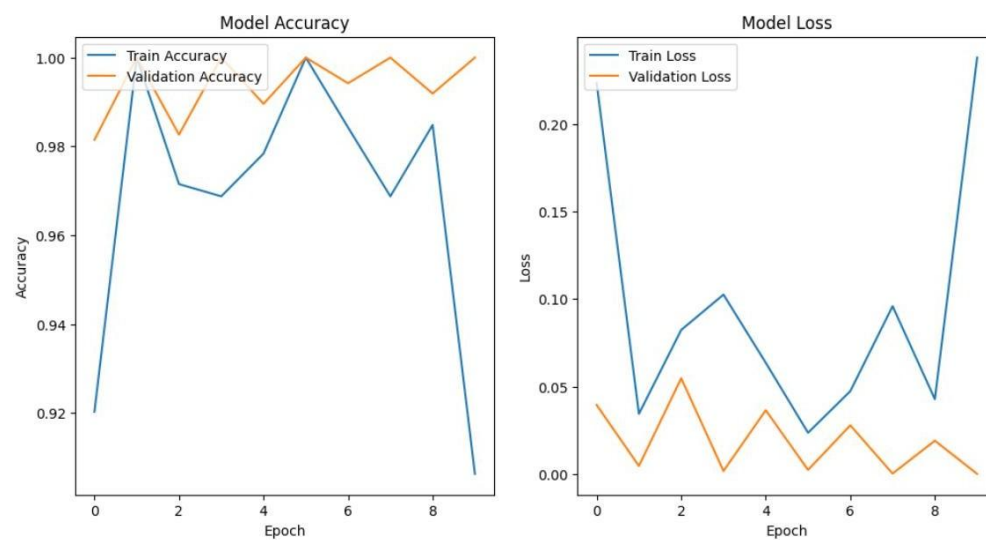## 1.) Activation function:Relu


```
Training Accuracy: 1.0000
Validation Accuracy: 1.0000
Found 880 images belonging to 5 classes.
28/28 ——————————— 75s 3s/step - accuracy: 0.9987 - loss: 0.0059
Test Loss: 0.009518560953438282, Test Accuracy: 0.9977
28/28 ——————————— 89s 3s/step
```
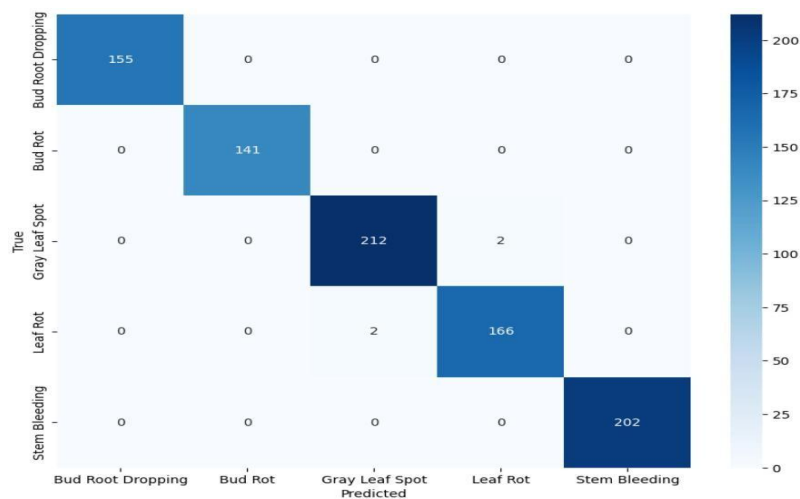
	precision	recall	f1-score	support
Bud Root Dropping	1.00	1.00	1.00	155
Bud Rot	1.00	1.00	1.00	141
Gray Leaf Spot	0.99	1.00	1.00	214
Leaf Rot	1.00	0.99	0.99	168
Stem Bleeding	1.00	1.00	1.00	202
accuracy			1.00	880
macro avg	1.00	1.00	1.00	880
weighted avg	1.00	1.00	1.00	880

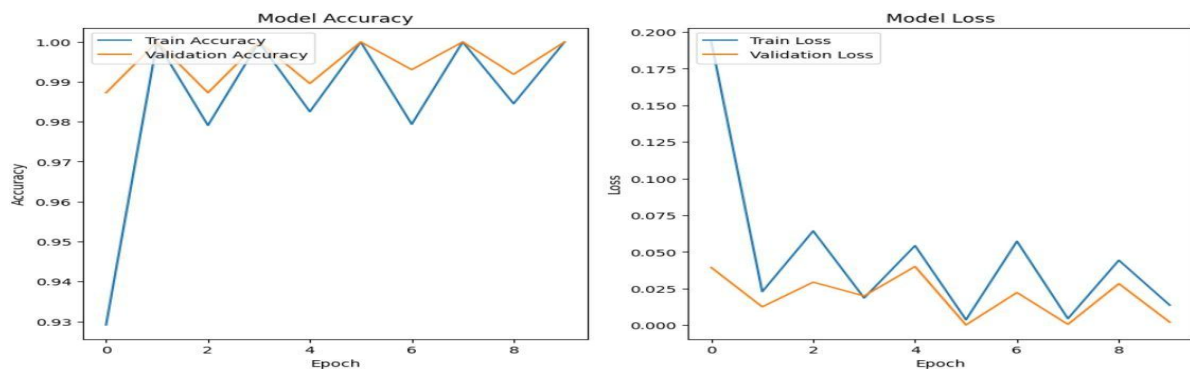## 2 .) Activation function:LeakyRelu

```
Training Accuracy: 0.9062
Validation Accuracy: 1.0000
Found 880 images belonging to 5 classes.
28/28 ──────────────── 73s 3s/step - accuracy: 0.9969 - loss: 0.0102
Test Loss: 0.0132132014259696, Test Accuracy: 0.9955
28/28 ──────────────── 92s 3s/step
```
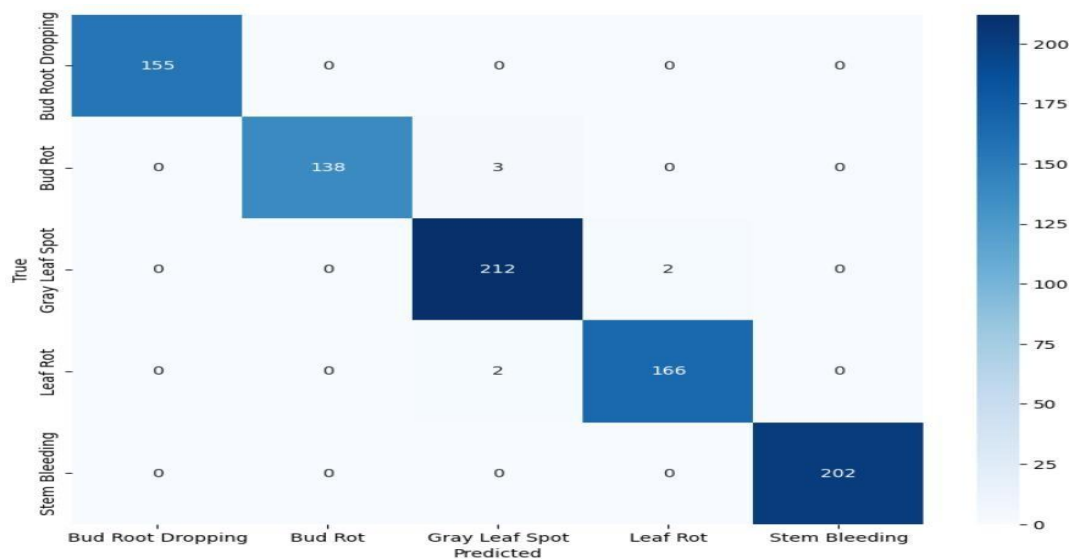
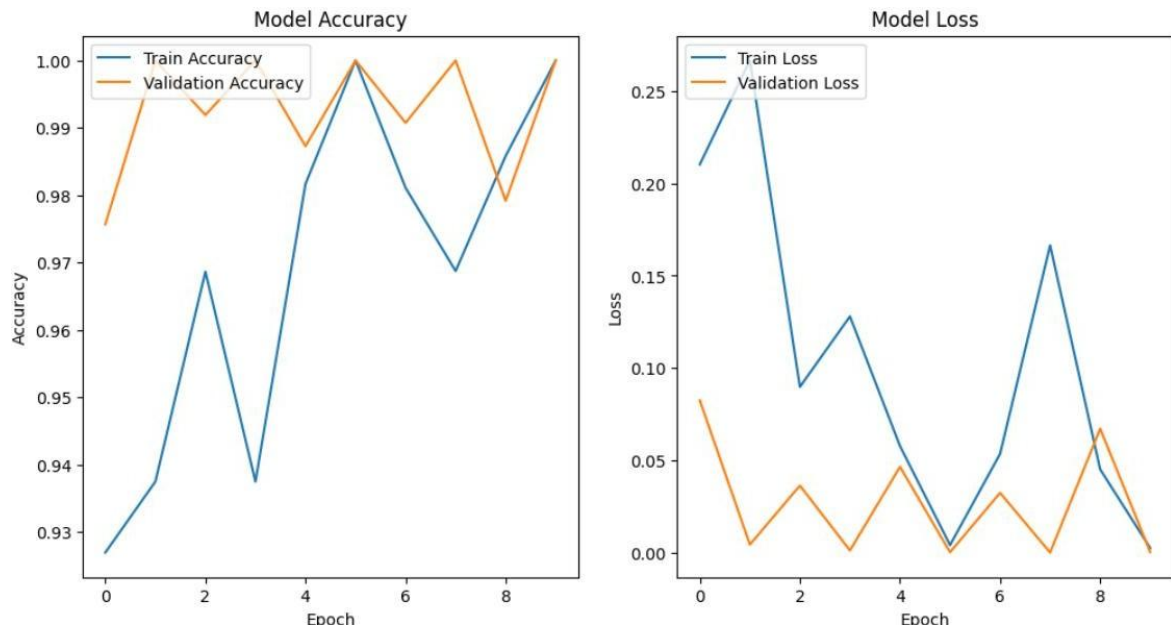|	precision	recall	f1-score	support
Bud Root Dropping	1.00	1.00	1.00	155
Bud Rot	1.00	1.00	1.00	141
Gray Leaf Spot	0.99	0.99	0.99	214
Leaf Rot	0.99	0.99	0.99	168
Stem Bleeding	1.00	1.00	1.00	202
accuracy			1.00	880
macro avg	1.00	1.00	1.00	880
weighted avg	1.00	1.00	1.00	880

3) Activation function:Swish


```
Training Accuracy: 1.0000
Validation Accuracy: 1.0000
Found 880 images belonging to 5 classes.
28/28 ———————————— 73s 3s/step - accuracy: 0.9929 - loss: 0.0130
Test Loss: 0.014944643713533878, Test Accuracy: 0.9920
28/28 ———————————— 90s 3s/step
```
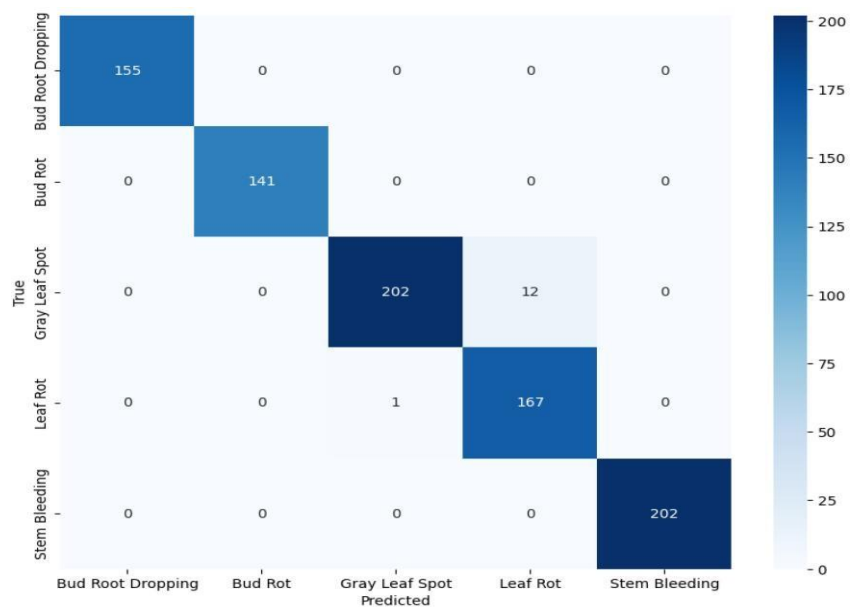

	precision	recall	f1-score	support
Bud Root Dropping	1.00	1.00	1.00	155
Bud Rot	1.00	0.98	0.99	141
Gray Leaf Spot	0.98	0.99	0.98	214
Leaf Rot	0.99	0.99	0.99	168
Stem Bleeding	1.00	1.00	1.00	202
accuracy			0.99	880
macro avg	0.99	0.99	0.99	880
weighted avg	0.99	0.99	0.99	880

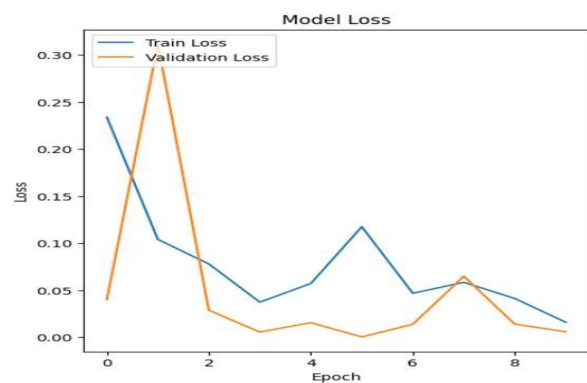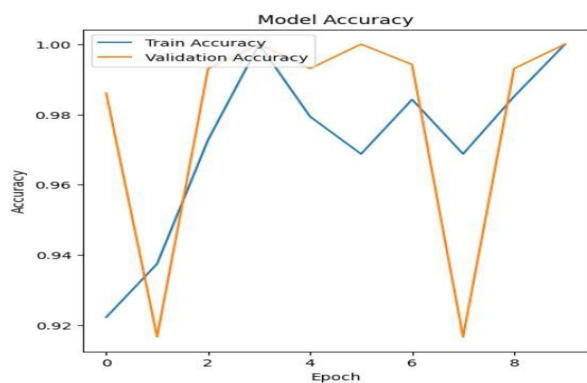# 4.) Activation function:Elu


```
Training Accuracy: 1.0000
Validation Accuracy: 1.0000
Found 880 images belonging to 5 classes.
28/28 ━━━━━━━━━━━━━━━━ 73s 3s/step - accuracy: 0.9878 - loss: 0.0364
Test Loss: 0.0420321524143219, Test Accuracy: 0.9852
28/28 ━━━━━━━━━━━━━━━━ 92s 3s/step
```

	precision	recall	f1-score	support
Bud Root Dropping	1.00	1.00	1.00	155
Bud Rot	1.00	1.00	1.00	141
Gray Leaf Spot	1.00	0.94	0.97	214
Leaf Rot	0.93	0.99	0.96	168
Stem Bleeding	1.00	1.00	1.00	202
accuracy			0.99	880
macro avg	0.99	0.99	0.99	880
weighted avg	0.99	0.99	0.99	880

Resnet 50:

1.) Activation function:Relu
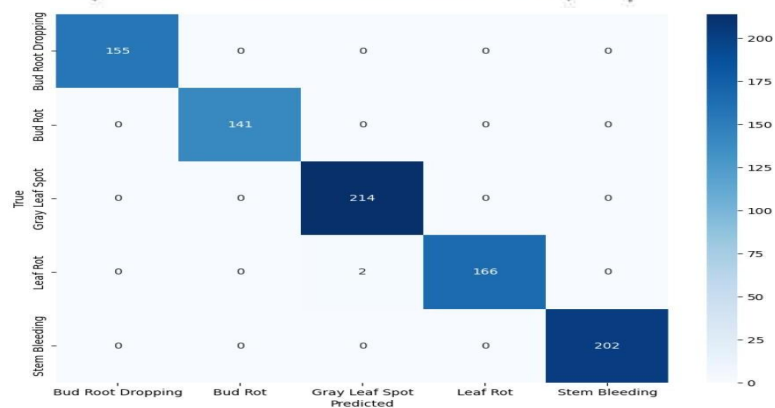


```
Training Accuracy: 1.0000
Validation Accuracy: 1.0000
Found 880 images belonging to 5 classes.
28/28 ──────────── 72s 3s/step - accuracy: 0.9987 - loss: 0.0047
Test Loss: 0.008352978155016899, Test Accuracy: 0.9977
28/28 ──────────── 72s 2s/step
```
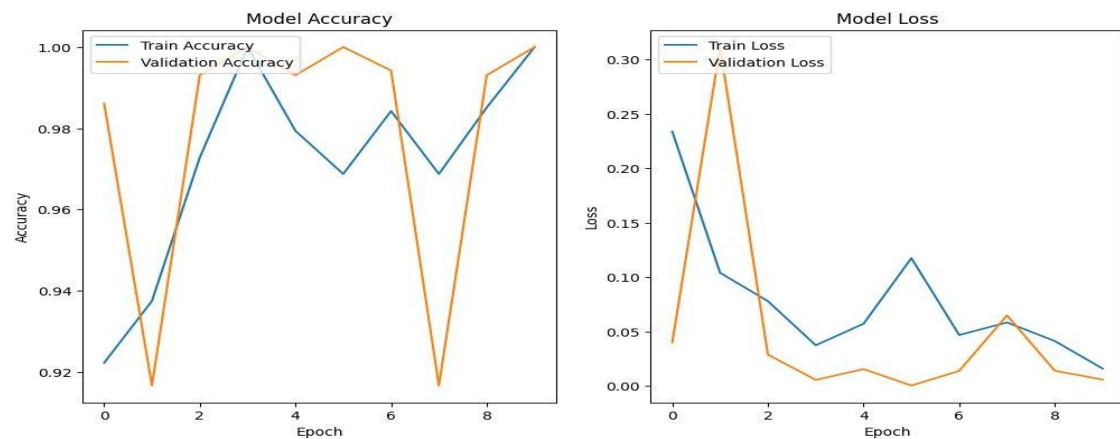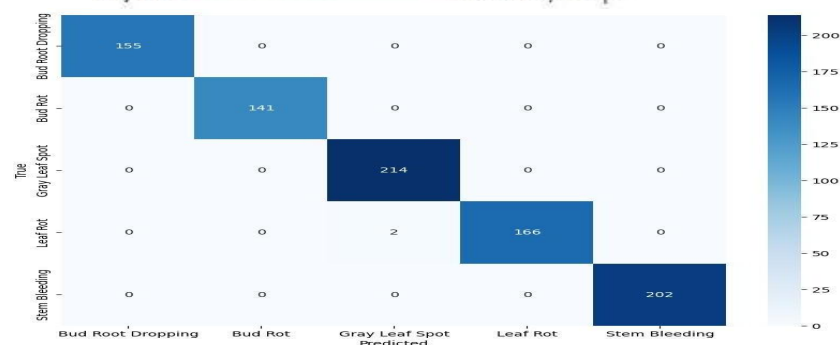
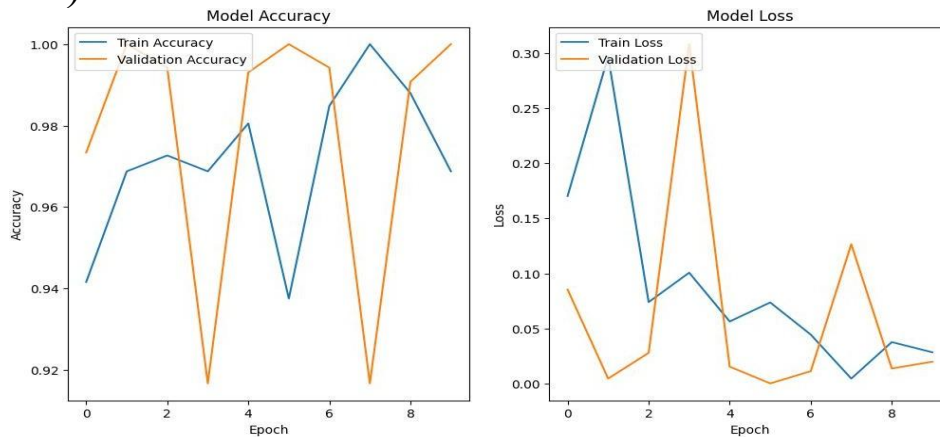|	precision	recall	f1-score	support
Bud Root Dropping	1.00	1.00	1.00	155
Bud Rot	1.00	1.00	1.00	141
Gray Leaf Spot	0.99	1.00	1.00	214
Leaf Rot	1.00	0.99	0.99	168
Stem Bleeding	1.00	1.00	1.00	202
accuracy			1.00	880
macro avg	1.00	1.00	1.00	880
weighted avg	1.00	1.00	1.00	880

2 .) Activation function:LeakyRelu

Training Accuracy: 1.0000
Validation Accuracy: 1.0000
Found 880 images belonging to 5 classes.
28/28 ─────────────── 45s 2s/step - accuracy: 0.9931 - loss: 0.0165
Test Loss: 0.019755743443965912, Test Accuracy: 0.9920
28/28 ─────────────── 50s 2s/step

	precision	recall	f1-score	support
Bud Root Dropping	1.00	1.00	1.00	155
Bud Rot	0.99	1.00	1.00	141
Gray Leaf Spot	1.00	0.97	0.98	214
Leaf Rot	0.97	1.00	0.98	168
Stem Bleeding	1.00	1.00	1.00	202
accuracy			0.99	880
macro avg	0.99	0.99	0.99	880
weighted avg	0.99	0.99	0.99	880

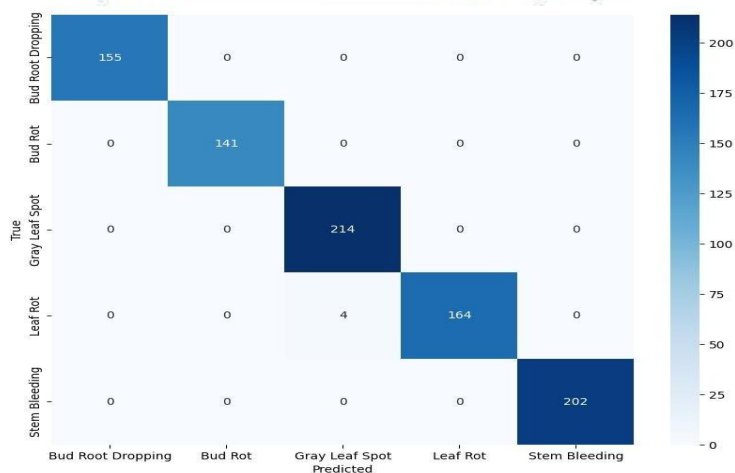# 3.) Activation function:Swish


```
Training Accuracy: 0.9688
Validation Accuracy: 1.0000
Found 880 images belonging to 5 classes.
28/28 ─────────────── 69s 2s/step - accuracy: 0.9975 - loss: 0.0068
Test Loss: 0.011028558947145939, Test Accuracy: 0.9955
28/28 ─────────────── 80s 3s/step
```
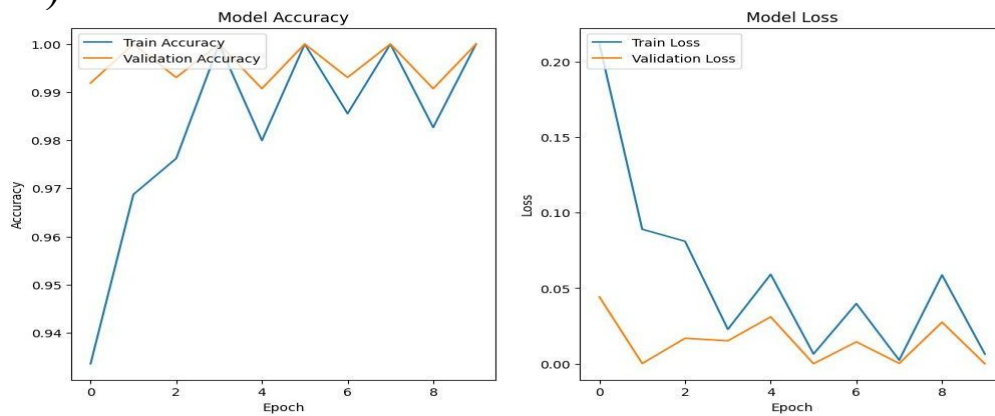

	precision	recall	f1-score	support
Bud Root Dropping	1.00	1.00	1.00	155
Bud Rot	1.00	1.00	1.00	141
Gray Leaf Spot	0.98	1.00	0.99	214
Leaf Rot	1.00	0.98	0.99	168
Stem Bleeding	1.00	1.00	1.00	202
accuracy			1.00	880
macro avg	1.00	1.00	1.00	880
weighted avg	1.00	1.00	1.00	880

4.)Activation function:Elu
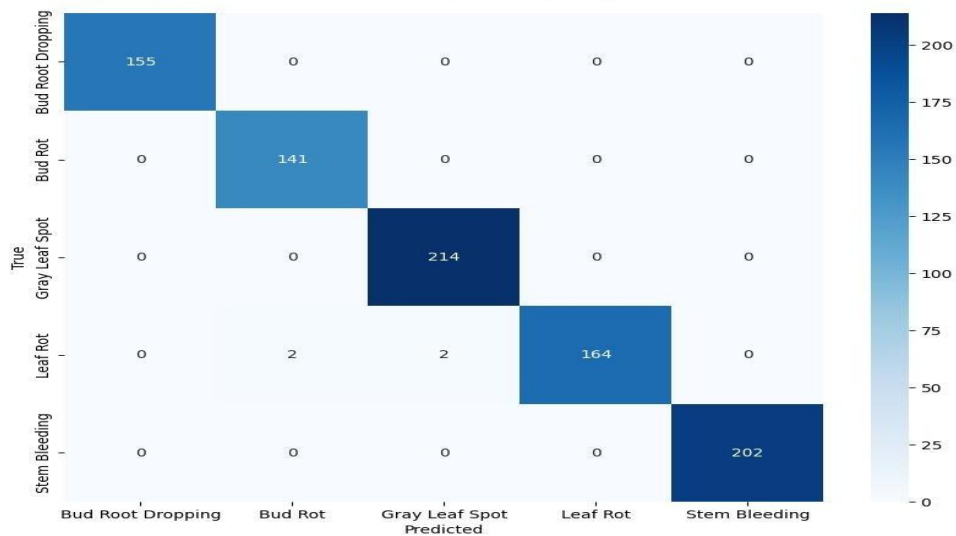


```
Training Accuracy: 1.0000
Validation Accuracy: 1.0000
Found 880 images belonging to 5 classes.
28/28 ──────────────── 46s 2s/step - accuracy: 0.9978 - loss: 0.0051
Test Loss: 0.010269897989928722, Test Accuracy: 0.9955
28/28 ──────────────── 51s 2s/step
```
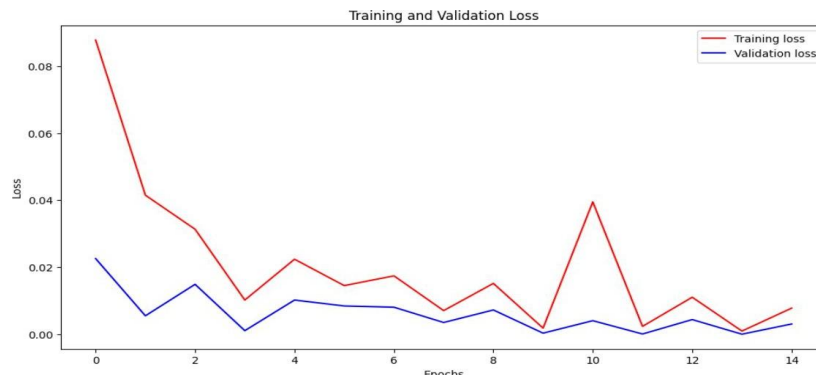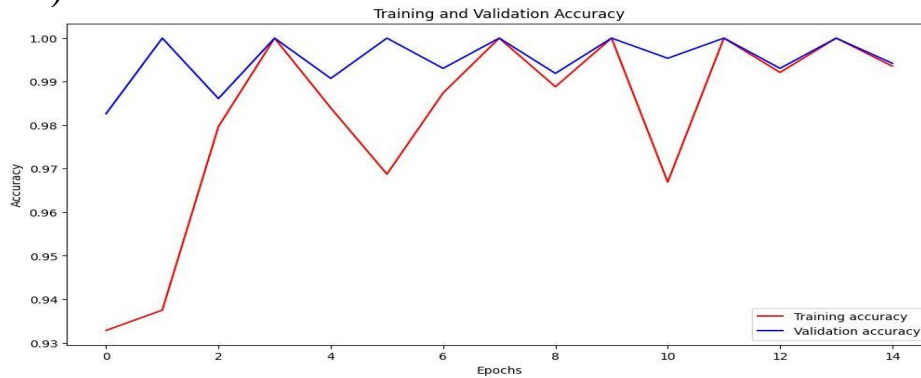

	precision	recall	f1-score	support
Bud Root Dropping	1.00	1.00	1.00	155
Bud Rot	0.99	1.00	0.99	141
Gray Leaf Spot	0.99	1.00	1.00	214
Leaf Rot	1.00	0.98	0.99	168
Stem Bleeding	1.00	1.00	1.00	202
accuracy			1.00	880
macro avg	1.00	1.00	1.00	880
weighted avg	1.00	1.00	1.00	880

Efficient B0:

1) Activation function:Relu

Training and Validation Accuracy

Training and Validation Loss

```
Found 880 images belonging to 5 classes.
28/28 ━━━━━━━━━━━━━━━ 53s 2s/step - accuracy: 0.9974 - loss: 0.0018
Test Loss: 0.003007813822478056, Test Accuracy: 0.9954545497894287
28/28 ━━━━━━━━━━━━━━━ 48s 2s/step
Class-wise Accuracies:
Bud Root Dropping: 100.00%
Bud Rot: 100.00%
Gray Leaf Spot: 100.00%
Leaf Rot: 97.62%
Stem Bleeding: 100.00%
```
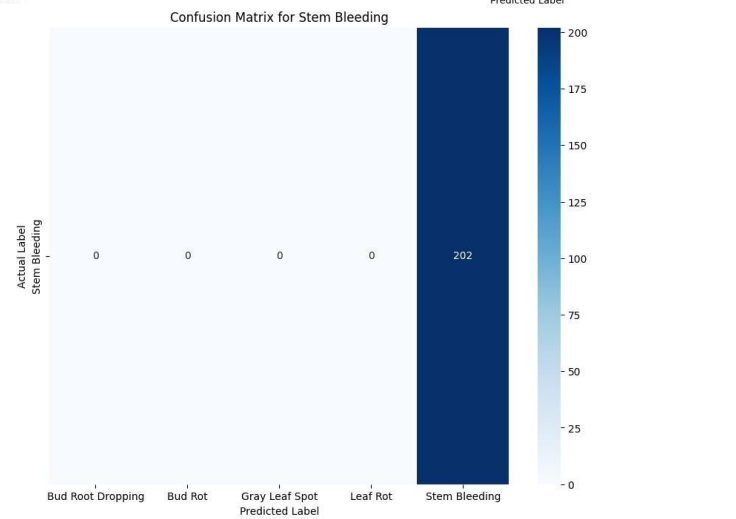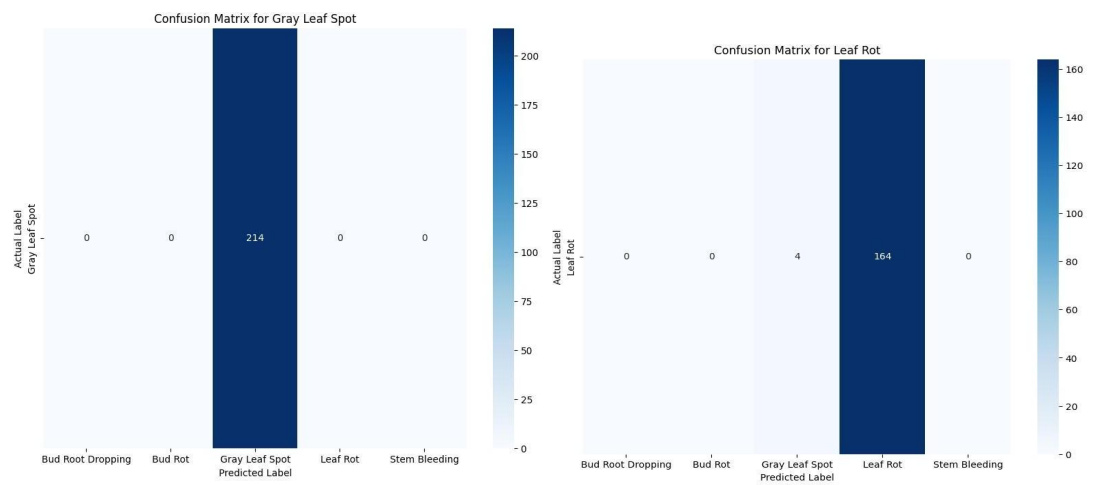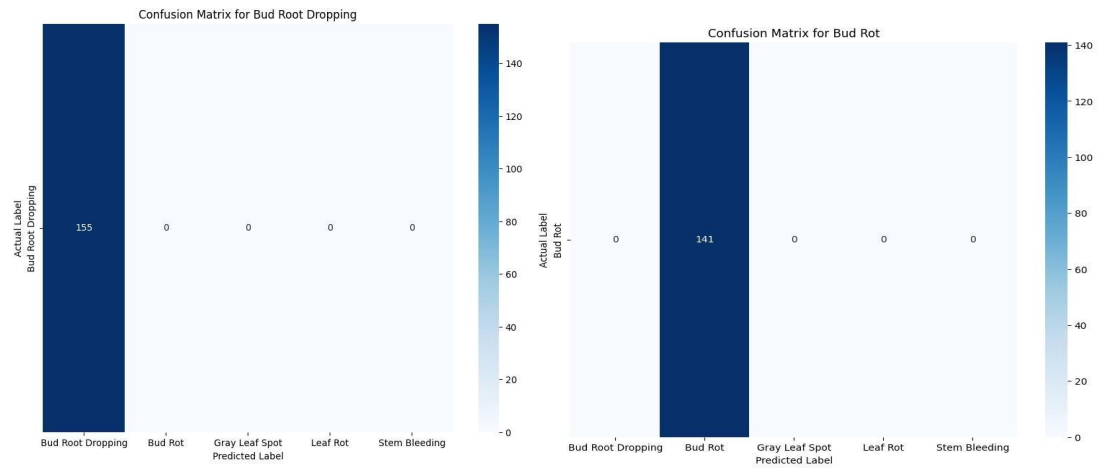
Confusion Matrix for Bud Root Dropping

Confusion Matrix for Bud Rot

Confusion Matrix for Gray Leaf Spot

Confusion Matrix for Leaf Rot

Confusion Matrix for Stem Bleeding

	class	precision	recall	f1-score	support
0	Bud Root Dropping	1.000000	1.000000	1.000000	155.0
1	Bud Rot	1.000000	1.000000	1.000000	141.0
2	Gray Leaf Spot	0.981651	1.000000	0.990741	214.0
3	Leaf Rot	1.000000	0.976190	0.987952	168.0
4	Stem Bleeding	1.000000	1.000000	1.000000	202.0
5	macro avg	0.996330	0.995238	0.995739	880.0
6	weighted avg	0.995538	0.995455	0.995448	880.0

2) Activation function:LeakyRelu
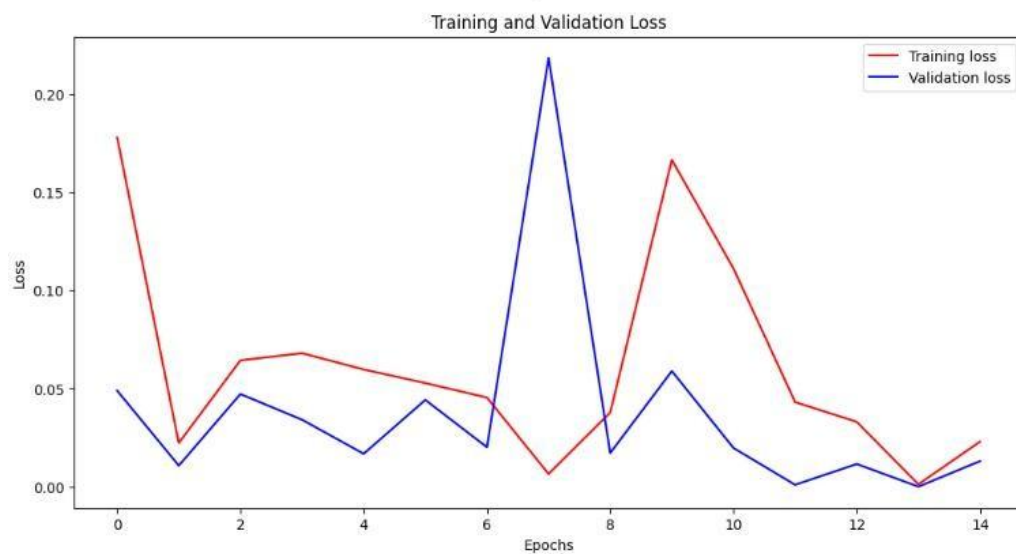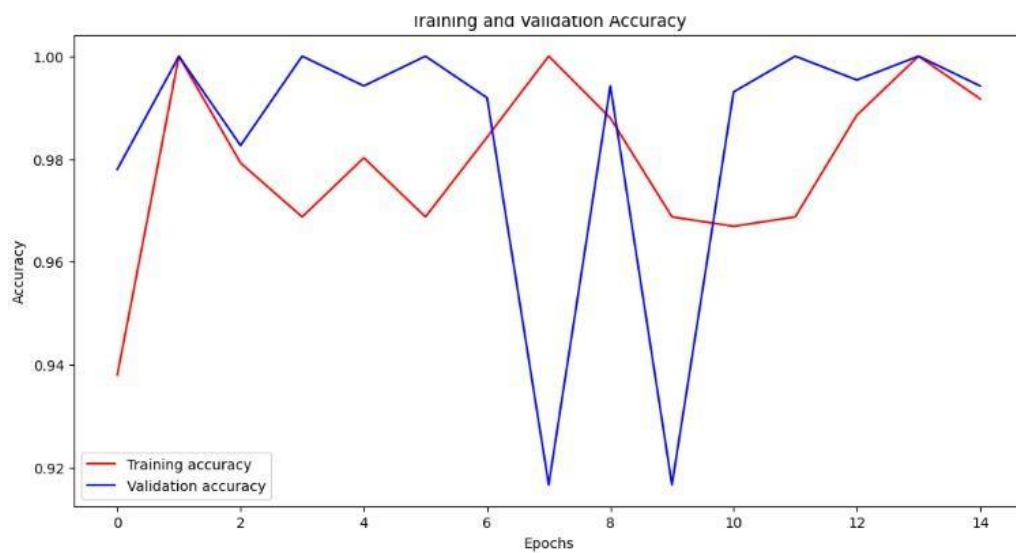
```
Found 880 images belonging to 5 classes.
28/28 ──────────────── 39s 1s/step - accuracy: 0.9979 - loss: 0.0040
Test Loss: 0.005188087001442909, Test Accuracy: 0.9977272748947144
28/28 ──────────────── 45s 1s/step
Class-wise Accuracies:
Bud Root Dropping: 100.00%
Bud Rot: 99.29%
Gray Leaf Spot: 100.00%
Leaf Rot: 99.40%
Stem Bleeding: 100.00%
```
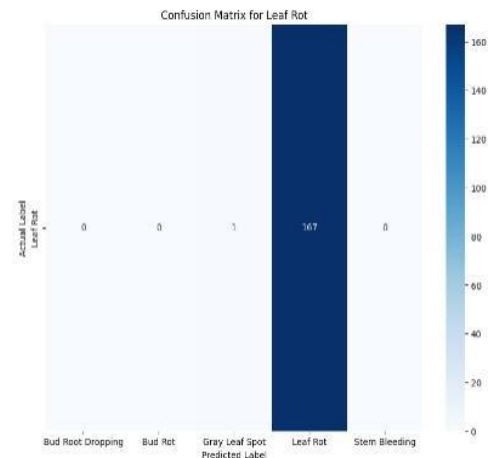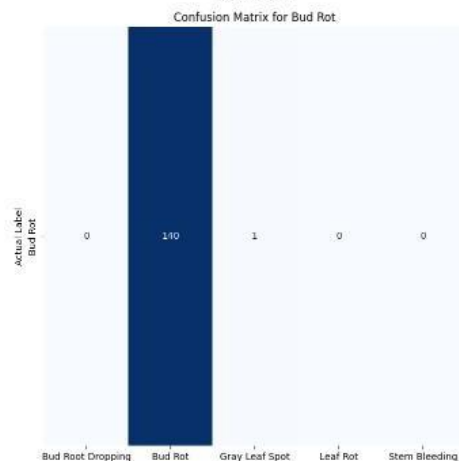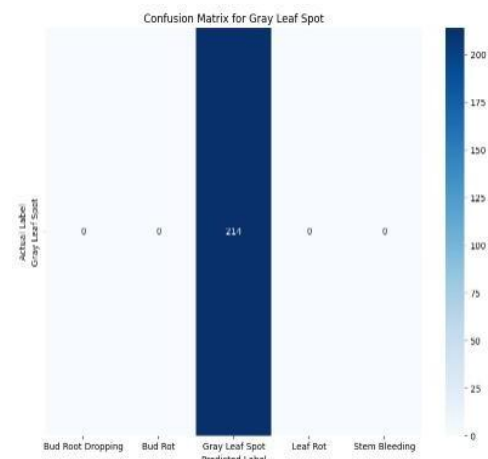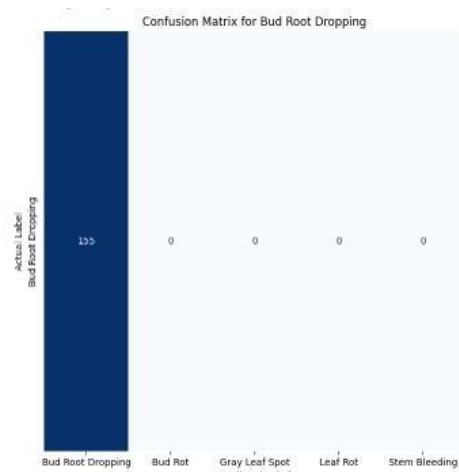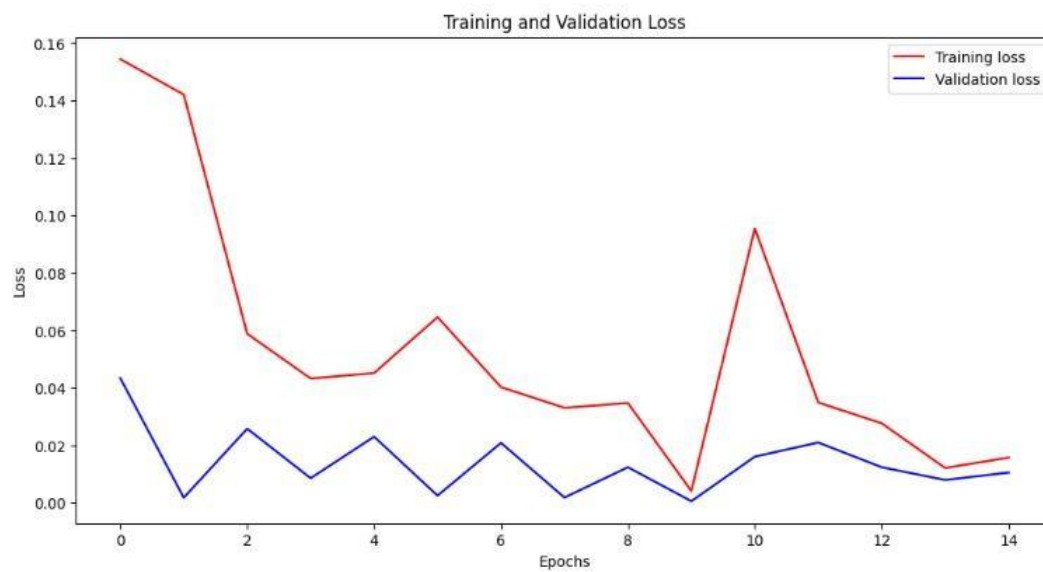
	class	precision	recall	f1-score	support
0	Bud Root Dropping	1.000000	1.000000	1.000000	155.0
1	Bud Rot	1.000000	0.992908	0.996441	141.0
2	Gray Leaf Spot	0.990741	1.000000	0.995349	214.0
3	Leaf Rot	1.000000	0.994048	0.997015	168.0
4	Stem Bleeding	1.000000	1.000000	1.000000	202.0
5	macro avg	0.998148	0.997391	0.997761	880.0
6	weighted avg	0.997748	0.997727	0.997729	880.0

Confusion Matrix for Bud Root Dropping

Confusion Matrix for Gray Leaf Spot

Confusion Matrix for Bud Rot

Confusion Matrix for Leaf Rot

Confusion Matrix for Stem Bleeding

3) Activation function:Swish

Training and Validation Accuracy

Training and Validation Loss
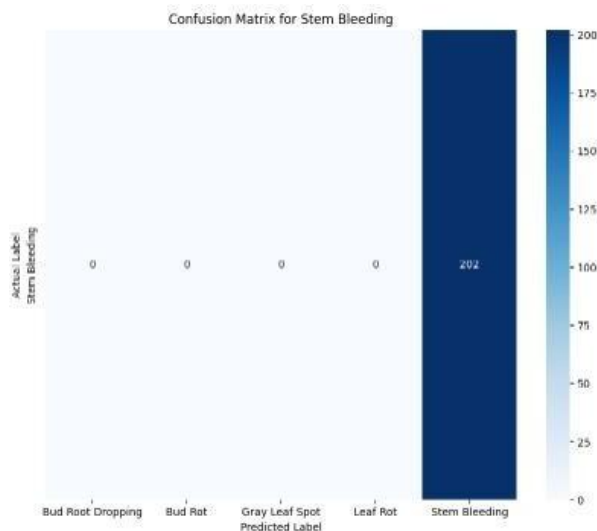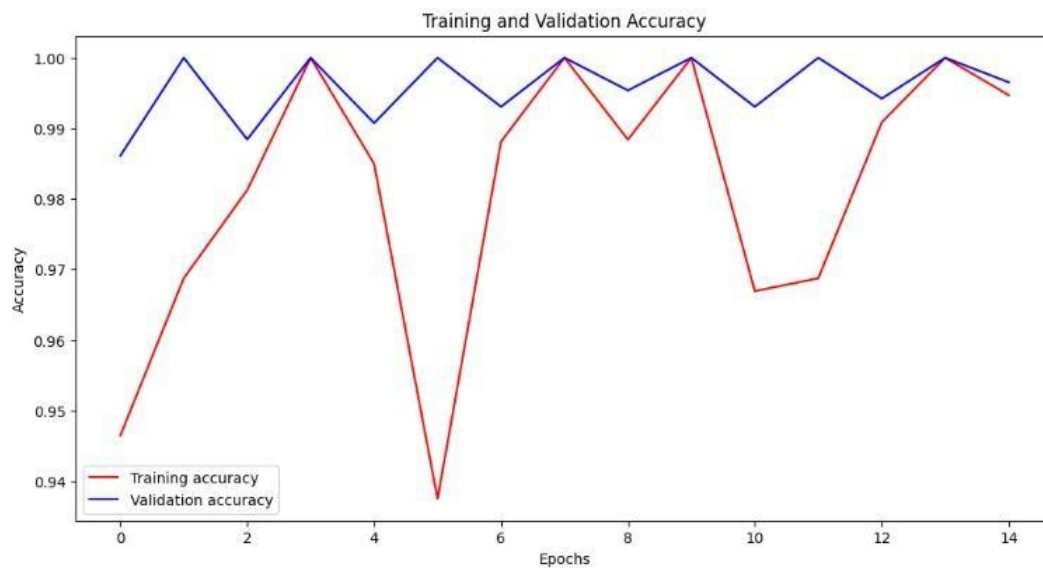
```
Found 880 images belonging to 5 classes.
28/28 ──────────────── 40s 1s/step - accuracy: 0.9980 - loss: 0.0042
Test Loss: 0.00680307112634182, Test Accuracy: 0.9965909123420715
28/28 ──────────────── 56s 2s/step
Class-wise Accuracies:
Bud Root Dropping: 100.00%
Bud Rot: 100.00%
Gray Leaf Spot: 100.00%
Leaf Rot: 98.21%
Stem Bleeding: 100.00%
```

	class	precision	recall	f1-score	support
0	Bud Root Dropping	1.000000	1.000000	1.000000	155.0
1	Bud Rot	1.000000	1.000000	1.000000	141.0
2	Gray Leaf Spot	0.986175	1.000000	0.993039	214.0
3	Leaf Rot	1.000000	0.982143	0.990991	168.0
4	Stem Bleeding	1.000000	1.000000	1.000000	202.0
5	macro avg	0.997235	0.996429	0.996806	880.0
6	weighted avg	0.996638	0.996591	0.996587	880.0

Confusion Matrix for Bud Root Dropping

Confusion Matrix for Gray Leaf Spot

Confusion Matrix for Bud Rot

Confusion Matrix for Leaf Rot

Confusion Matrix for Stem Bleeding

4) Activation function:Elu


```
Found 880 images belonging to 5 classes.
28/28 ──────────────── 37s 1s/step - accuracy: 0.9987 - loss: 0.0039
Test Loss: 0.0057625435292720795, Test Accuracy: 0.9977272748947144
28/28 ──────────────── 41s 1s/step
Class-wise Accuracies:
Bud Root Dropping: 100.00%
Bud Rot: 100.00%
Gray Leaf Spot: 100.00%
Leaf Rot: 98.81%
Stem Bleeding: 100.00%
               class  precision    recall  f1-score  support
0  Bud Root Dropping   1.000000  1.000000  1.000000    155.0
1            Bud Rot   1.000000  1.000000  1.000000    141.0
2     Gray Leaf Spot   0.995349  1.000000  0.997669    214.0
3           Leaf Rot   1.000000  0.988095  0.994012    168.0
4      Stem Bleeding   0.995074  1.000000  0.997531    202.0
5          macro avg   0.998085  0.997619  0.997842    880.0
6       weighted avg   0.997738  0.997727  0.997723    880.0
```
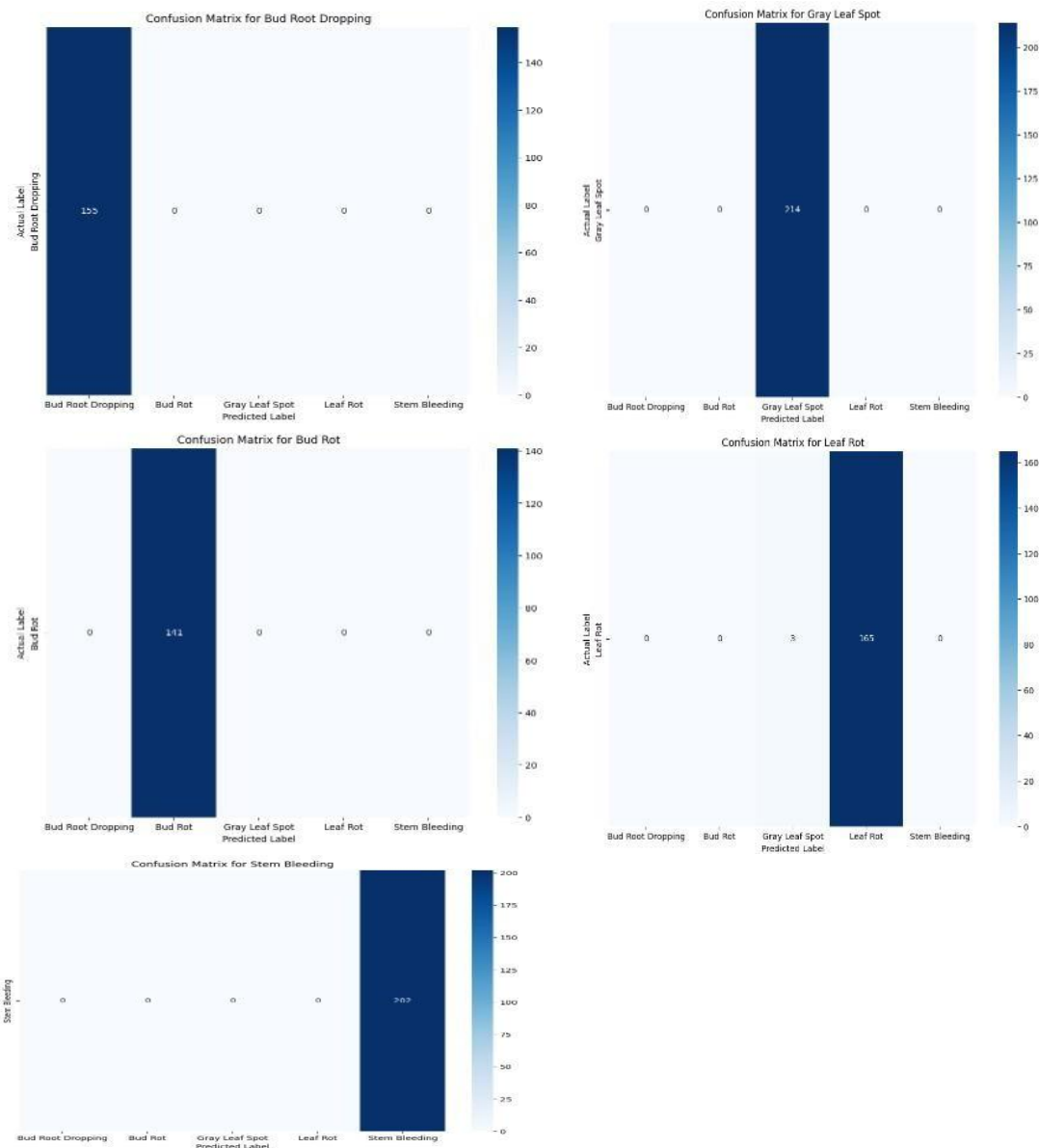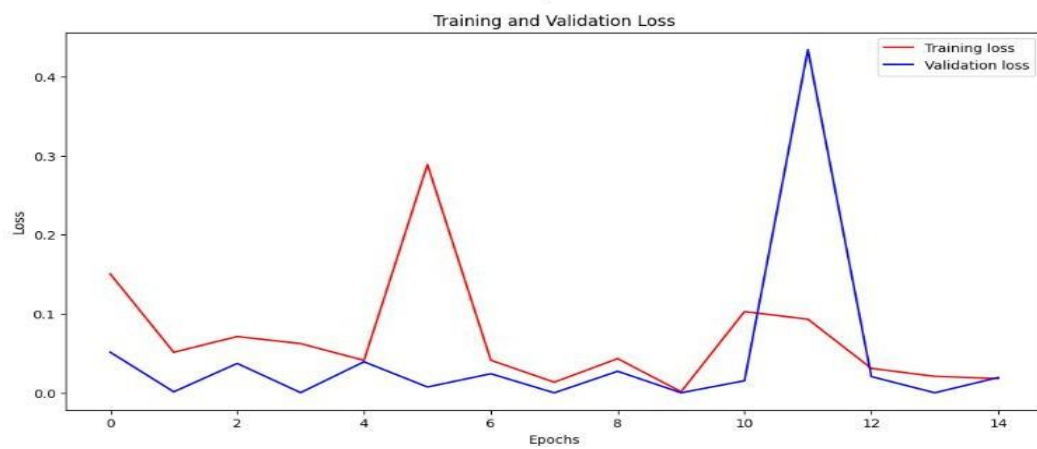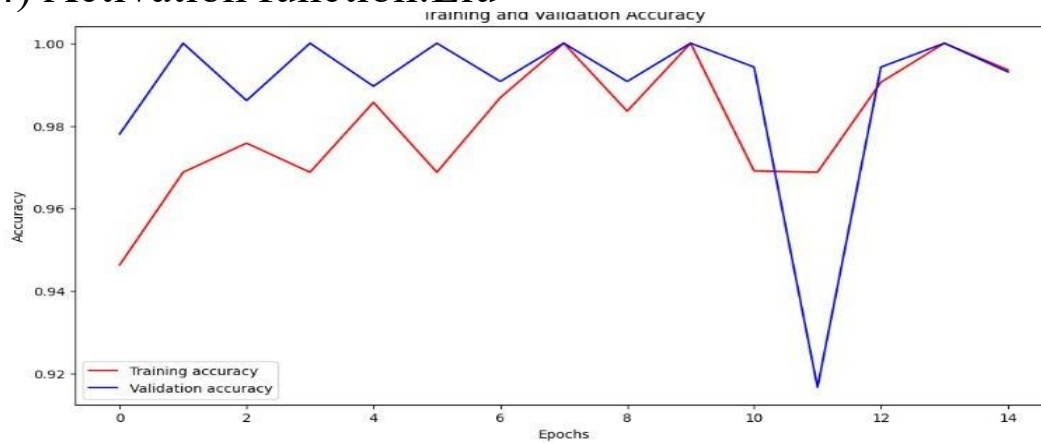
Confusion Matrix for Bud Root Dropping

Confusion Matrix for Gray Leaf Spot

Confusion Matrix for Bud Rot

Confusion Matrix for Leaf Rot

Confusion Matrix for Stem Bleeding