```
# Mount the drive here

from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

In [2]:

```
import zipfile
import os


# Define the path to the zip file and the extraction directory
zip_file_path = "/content/drive/MyDrive/archive (2).zip"
extract_dir = "/content"

# Check if the zip file exists
if os.path.exists(zip_file_path):
    try:
        # Create a ZipFile object
        with zipfile.ZipFile(zip_file_path, 'r') as zip_ref:
            # Extract all contents to the specified directory
            zip_ref.extractall(extract_dir)
        print(f"Successfully extracted '{zip_file_path}' to '{extract_dir}'")
    except zipfile.BadZipFile:
        print(f"Error: '{zip_file_path}' is not a valid zip file.")
    except Exception as e:
        print(f"An error occurred: {e}")
else:
    print(f"Error: '{zip_file_path}' does not exist.")
```

```
Successfully extracted '/content/drive/MyDrive/archive (2).zip' to '/content'
```

In [3]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import pathlib
import os
import glob as gb
import glob
import cv2
import tensorflow as tf
```

In [4]:

```
train='/content/New Plant Diseases Dataset(Augmented)/New Plant Diseases
Dataset(Augmented)/train'
```

In [5]:

```
size=224
```

In [6]:

```
train_generator=tf.keras.preprocessing.image.ImageDataGenerator(
    rotation_range=90,
    width_shift_range=0.0,
    height_shift_range=0.0,
    shear_range=0.0,
    zoom_range=0.0,
    horizontal_flip=False,
    vertical_flip=False,
    rescale=1/255.0,
    preprocessing_function=None,
    validation_split=0.1,
).flow_from_directory(train,
                      batch_size=164,
                      target_size=(size,size),
                      subset="training",
                      color_mode='rgb', #"rgb", "rgba", or "grayscale"
                      class_mode='categorical',  # Use 'binary', 'sparse','categorical' or
None as needed
                      shuffle=True)
```

```
Found 63282 images belonging to 38 classes.
```

In [7]:

```
train_generator.class_indices
```

Out[7]:

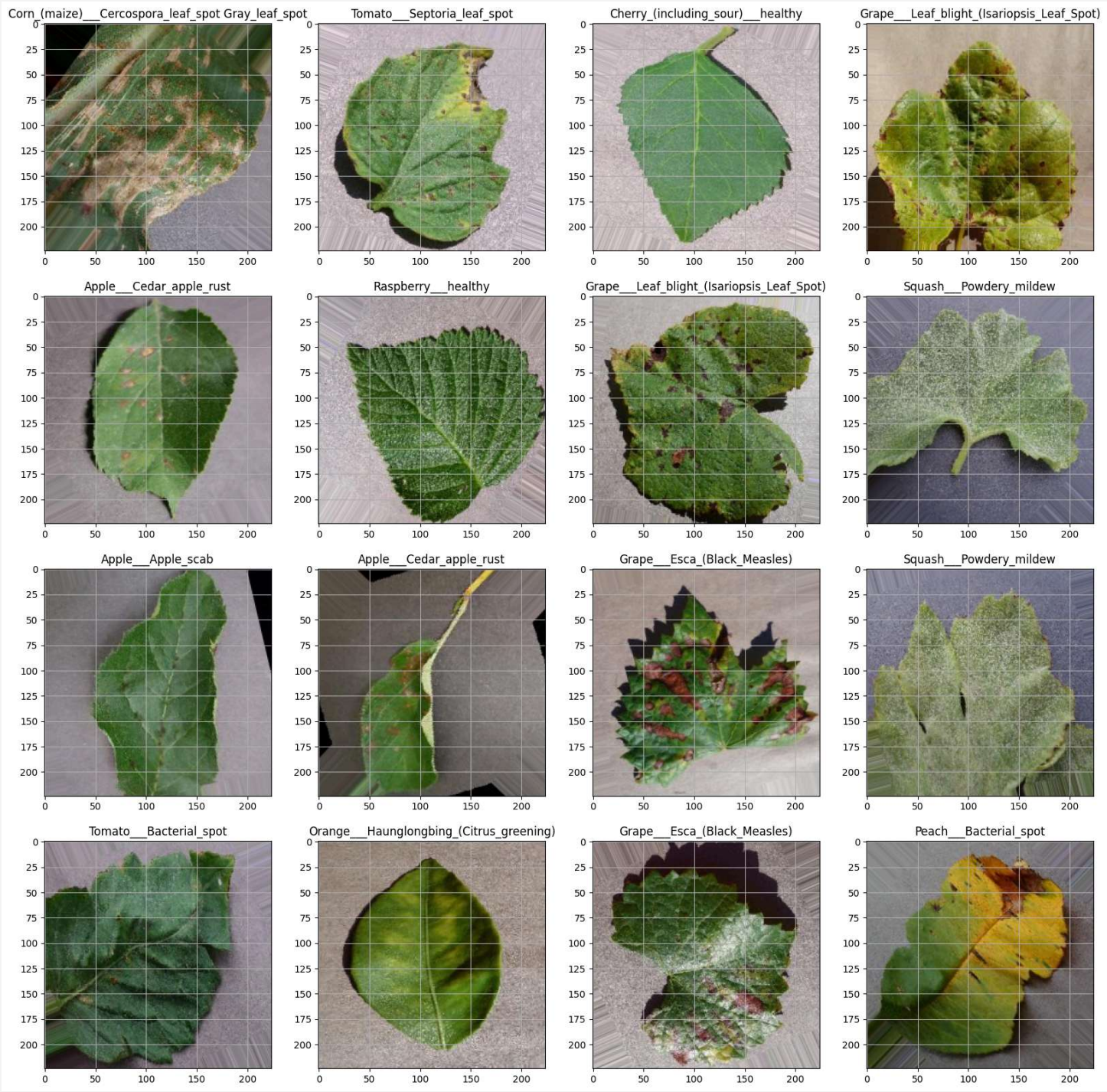
```
{'Apple___Apple_scab': 0,
 'Apple___Black_rot': 1,
 'Apple___Cedar_apple_rust': 2,
 'Apple___healthy': 3,
 'Blueberry___healthy': 4,
 'Cherry_(including_sour)___Powdery_mildew': 5,
 'Cherry_(including_sour)___healthy': 6,
 'Corn_(maize)___Cercospora_leaf_spot Gray_leaf_spot': 7,
 'Corn_(maize)___Common_rust_': 8,
 'Corn_(maize)___Northern_Leaf_Blight': 9,
 'Corn_(maize)___healthy': 10,
 'Grape___Black_rot': 11,
 'Grape___Esca_(Black_Measles)': 12,
 'Grape___Leaf_blight_(Isariopsis_Leaf_Spot)': 13,
 'Grape___healthy': 14,
 'Orange___Haunglongbing_(Citrus_greening)': 15,
 'Peach___Bacterial_spot': 16,
 'Peach___healthy': 17,
 'Pepper,_bell___Bacterial_spot': 18,
```

```
 'Pepper,_bell___healthy': 19,
 'Potato___Early_blight': 20,
 'Potato___Late_blight': 21,
 'Potato___healthy': 22,
 'Raspberry___healthy': 23,
 'Soybean___healthy': 24,
 'Squash___Powdery_mildew': 25,
 'Strawberry___Leaf_scorch': 26,
 'Strawberry___healthy': 27,
 'Tomato___Bacterial_spot': 28,
 'Tomato___Early_blight': 29,
 'Tomato___Late_blight': 30,
 'Tomato___Leaf_Mold': 31,
 'Tomato___Septoria_leaf_spot': 32,
 'Tomato___Spider_mites Two-spotted_spider_mite': 33,
 'Tomato___Target_Spot': 34,
 'Tomato___Tomato_Yellow_Leaf_Curl_Virus': 35,
 'Tomato___Tomato_mosaic_virus': 36,
 'Tomato___healthy': 37}
```

In [8]:

```
#let's display some images from training set

classes=list(train_generator.class_indices.keys())
plt.figure(figsize=(20,20))
for X_batch, y_batch in train_generator:
    # create a grid of 3x3 images
    for i in range(0,16):
        plt.subplot(4,4,i+1)
        plt.imshow(X_batch[i])
        plt.title(classes[np.where(y_batch[i]==1)[0][0]])   # when y is categorical
        # plt.title(classes[int(y_batch[i])])   # when y is binary or sparse
        plt.grid(None)
    # show the plot
    plt.show()
    break
```



In [9]:

```
valid='/content/New Plant Diseases Dataset(Augmented)/New Plant Diseases
Dataset(Augmented)/valid'
```

In [10]:

```
valid_generator=tf.keras.preprocessing.image.ImageDataGenerator(
    rescale=1/255.0,
    preprocessing_function=None,
    validation_split=0.1,
).flow_from_directory(valid,
```

```
                      batch_size=164,
                      target_size=(224,224),
                      subset='validation',
                      color_mode='rgb', #"rgb", "rgba", or "grayscale"
                      class_mode='categorical',  # Use 'binary', 'sparse','categorical' or
None as needed
                      shuffle=False)
```

```
Found 1742 images belonging to 38 classes.
```

In [11]:

```
test='/content/New Plant Diseases Dataset(Augmented)/New Plant Diseases
Dataset(Augmented)/valid'
```

In [12]:

```
test_generator=tf.keras.preprocessing.image.ImageDataGenerator(
    rescale=1/255.0,
    preprocessing_function=None,
).flow_from_directory(test,
                      batch_size=164,
                      target_size=(224,224),
                      color_mode='rgb', #"rgb", "rgba", or "grayscale"
                      class_mode='categorical',  # Use 'binary', 'sparse','categorical' or
None as needed
                      shuffle=False)
```

```
Found 17572 images belonging to 38 classes.
```

In [13]:

```
test_generator.class_indices
```

Out[13]:

```
{'Apple___Apple_scab': 0,
 'Apple___Black_rot': 1,
 'Apple___Cedar_apple_rust': 2,
 'Apple___healthy': 3,
 'Blueberry___healthy': 4,
 'Cherry_(including_sour)___Powdery_mildew': 5,
 'Cherry_(including_sour)___healthy': 6,
 'Corn_(maize)___Cercospora_leaf_spot Gray_leaf_spot': 7,
 'Corn_(maize)___Common_rust_': 8,
 'Corn_(maize)___Northern_Leaf_Blight': 9,
 'Corn_(maize)___healthy': 10,
 'Grape___Black_rot': 11,
 'Grape___Esca_(Black_Measles)': 12,
 'Grape___Leaf_blight_(Isariopsis_Leaf_Spot)': 13,
 'Grape___healthy': 14,
 'Orange___Haunglongbing_(Citrus_greening)': 15,
 'Peach___Bacterial_spot': 16,
 'Peach___healthy': 17,
 'Pepper,_bell___Bacterial_spot': 18,
```

```
 'Pepper,_bell___healthy': 19,
 'Potato___Early_blight': 20,
 'Potato___Late_blight': 21,
 'Potato___healthy': 22,
 'Raspberry___healthy': 23,
 'Soybean___healthy': 24,
 'Squash___Powdery_mildew': 25,
 'Strawberry___Leaf_scorch': 26,
 'Strawberry___healthy': 27,
 'Tomato___Bacterial_spot': 28,
 'Tomato___Early_blight': 29,
 'Tomato___Late_blight': 30,
 'Tomato___Leaf_Mold': 31,
 'Tomato___Septoria_leaf_spot': 32,
 'Tomato___Spider_mites Two-spotted_spider_mite': 33,
 'Tomato___Target_Spot': 34,
 'Tomato___Tomato_Yellow_Leaf_Curl_Virus': 35,
 'Tomato___Tomato_mosaic_virus': 36,
 'Tomato___healthy': 37}
```

In [14]:

```
from tensorflow import keras
model = keras.models.Sequential()  # To build NN

model.add(keras.layers.Conv2D(filters=32, kernel_size=7, strides=1,
                padding="same", activation="relu", name="Conv1", input_shape= (224,224,3)))

model.add(keras.layers.MaxPool2D(pool_size=2, name="Pool1"))

model.add(keras.layers.Conv2D(filters=64, kernel_size=5, strides=1,
                              padding="same", activation="relu", name="Conv2"))
model.add(keras.layers.MaxPool2D(pool_size=2, name="Pool2"))

model.add(keras.layers.Conv2D(filters=128, kernel_size=3, strides=1,
                              padding="same", activation="relu", name="Conv3"))

model.add(keras.layers.Conv2D(filters=256, kernel_size=3, strides=1,
                              padding="same", activation="relu", name="Conv4"))

model.add(keras.layers.MaxPool2D(pool_size=2, name="Pool3"))

model.add(keras.layers.Flatten(name="Flatten1"))   #flatten layer - to convert into 1d
vector

model.add(keras.layers.Dense(128, activation="relu", name="Dense1"))  #hidden layer
tf.keras.layers.Dropout(0.5)

model.add(keras.layers.Dense(64, activation="relu", name="Dense2"))  #hidden layer
tf.keras.layers.Dropout(0.5)

model.add(keras.layers.Dense(38, activation="softmax", name="Output"))  #output layer

# The model's summary() method displays all the model's layers
print(model.summary())
```

```
/usr/local/lib/python3.11/dist-packages/keras/src/layers/convolutional/base_conv.py:107:
UserWarning: Do not pass an `input_shape`/`input_dim` argument to a layer. When using
Sequential models, prefer using an `Input(shape)` object as the first layer in the model
instead.
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
```

Model: "sequential"

Layer (type)	Output Shape	Param #
Conv1 (Conv2D)	(None, 224, 224, 32)	4,736
Pool1 (MaxPooling2D)	(None, 112, 112, 32)	0
Conv2 (Conv2D)	(None, 112, 112, 64)	51,264
Pool2 (MaxPooling2D)	(None, 56, 56, 64)	0
Conv3 (Conv2D)	(None, 56, 56, 128)	73,856
Conv4 (Conv2D)	(None, 56, 56, 256)	295,168
Pool3 (MaxPooling2D)	(None, 28, 28, 256)	0
Flatten1 (Flatten)	(None, 200704)	0
Dense1 (Dense)	(None, 128)	25,690,240
Dense2 (Dense)	(None, 64)	8,256
Output (Dense)	(None, 38)	2,470

Total params: 26,125,990 (99.66 MB)

Trainable params: 26,125,990 (99.66 MB)

Non-trainable params: 0 (0.00 B)

None