```
> confusion_matrix <- confusionMatrix(predictions, testing_data$Class)
> print(confusion_matrix)
Confusion Matrix and Statistics

                    Reference
Prediction           alternarialeaf-spot anthracnose bacterial-blight bacterial-pustule brown-spot brown-stem-rot
  alternarialeaf-spot                  18           0               0                0          2              0
  anthracnose                           0           3               0                0          0              0
  bacterial-blight                      0           0               4                2          0              0
  bacterial-pustule                     0           0               0                1          0              0
  brown-spot                            0           0               0                0          7              0
  brown-stem-rot                        0           0               0                0          0              2
  charcoal-rot                          0           0               0                0          0              4
  diaporthe-stem-canker                 0           3               0                0          0              0
  downy-mildew                          0           0               0                1          0              0
  frog-eye-leaf-spot                    0           0               0                0          0              0
  phyllosticta-leaf-spot                0           0               0                0          9              0
  phytophthora-rot                      0           2               0                0          0              0
  powdery-mildew                        0           0               0                0          0              2
  purple-seed-stain                     0           0               0                0          0              0
  rhizoctonia-root-rot                  0           0               0                0          0              0
                    Reference
Prediction           charcoal-rot diaporthe-stem-canker downy-mildew frog-eye-leaf-spot phyllosticta-leaf-spot
  alternarialeaf-spot            0                    0           0                 7                      0
  anthracnose                    0                    0           0                 0                      0
  bacterial-blight               0                    0           0                 0                      0
  bacterial-pustule              0                    0           0                 0                      0
  brown-spot                     0                    0           0                 0                      0
  brown-stem-rot                 0                    0           0                 0                      0
  charcoal-rot                   4                    0           0                 0                      0
  diaporthe-stem-canker          0                    4           0                 0                      0
  downy-mildew                   0                    0           4                 0                      0
  frog-eye-leaf-spot             0                    0           0                 9                      0
  phyllosticta-leaf-spot         0                    0           0                 2                      4
  phytophthora-rot               0                    0           0                 0                      0
  powdery-mildew                 0                    0           0                 0                      0
  purple-seed-stain              0                    0           0                 0                      0
  rhizoctonia-root-rot           0                    0           0                 0                      0
                    Reference
Prediction           phytophthora-rot powdery-mildew purple-seed-stain rhizoctonia-root-rot
  alternarialeaf-spot                0              0                0                    0
  anthracnose                        0              0                0                    0
  bacterial-blight                   0              0                0                    0
  bacterial-pustule                  0              0                0                    0
  brown-spot                         0              0                0                    0
  brown-stem-rot                     0              0                0                    0
  charcoal-rot                       0              0                0                    0
  diaporthe-stem-canker              0              0                0                    0
  downy-mildew                       0              0                0                    0
  frog-eye-leaf-spot                 0              0                0                    0
  phyllosticta-leaf-spot             0              0                0                    0
  phytophthora-rot                   4              0                0                    0
  powdery-mildew                     0              4                0                    0
  purple-seed-stain                  0              0                4                    0
  rhizoctonia-root-rot               0              0                0                    4
```

```
> nb_model <- naiveBayes(Class ~ ., data = training_data)
> nb_model

Naive Bayes Classifier for Discrete Predictors

Call:
naiveBayes.default(x = X, y = Y, laplace = laplace)

A-priori probabilities:
Y
   alternarialeaf-spot            anthracnose       bacterial-blight      bacterial-pustule            brown-spot
            0.16150442            0.07964602            0.03539823            0.03539823            0.16371681
       brown-stem-rot          charcoal-rot  diaporthe-stem-canker          downy-mildew     frog-eye-leaf-spot
            0.07964602            0.03539823            0.03539823            0.03539823            0.16150442
phyllosticta-leaf-spot       phytophthora-rot          powdery-mildew      purple-seed-stain   rhizoctonia-root-rot
            0.03539823            0.03539823            0.03539823            0.03539823            0.03539823

Conditional probabilities:
                        date
Y                            [,1]       [,2]
  alternarialeaf-spot     0.77251550 0.5118915
  anthracnose             0.43793441 0.9608701
  bacterial-blight       -0.22331616 0.4858790
  bacterial-pustule      -0.56231171 0.7370774
  brown-spot             -0.96238753 0.8022657
  brown-stem-rot          0.45467493 0.4885414
  charcoal-rot            0.68067196 0.6555790
  diaporthe-stem-canker   0.37934258 0.6555790
  downy-mildew           -0.22331616 0.9039881
  frog-eye-leaf-spot      0.49182512 0.5591201
  phyllosticta-leaf-spot -0.82597491 0.4858790
  phytophthora-rot       -1.61696452 0.6403988
  powdery-mildew         -0.07265148 1.1618452
  purple-seed-stain       0.37934258 0.6555790
  rhizoctonia-root-rot   -1.42863366 0.6915274
```

```
> predictions <- predict(nb_model, newdata = testing_data)
> predictions
  [1] diaporthe-stem-canker  diaporthe-stem-canker  charcoal-rot          charcoal-rot          rhizoctonia-root-rot
  [6] rhizoctonia-root-rot   phytophthora-rot       phytophthora-rot      phytophthora-rot      charcoal-rot
 [11] charcoal-rot           brown-stem-rot         powdery-mildew        powdery-mildew        alternarialeaf-spot
 [16] phyllosticta-leaf-spot phyllosticta-leaf-spot phyllosticta-leaf-spot phyllosticta-leaf-spot phyllosticta-leaf-spot
 [21] phyllosticta-leaf-spot brown-spot             alternarialeaf-spot   brown-spot            bacterial-blight
 [26] bacterial-blight       bacterial-blight       bacterial-pustule     phytophthora-rot      anthracnose
 [31] phytophthora-rot       diaporthe-stem-canker  diaporthe-stem-canker phyllosticta-leaf-spot phyllosticta-leaf-spot
 [36] alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot   alternarialeaf-spot   alternarialeaf-spot
 [41] alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot   alternarialeaf-spot   frog-eye-leaf-spot
 [46] frog-eye-leaf-spot     alternarialeaf-spot    alternarialeaf-spot   phyllosticta-leaf-spot frog-eye-leaf-spot
 [51] diaporthe-stem-canker  diaporthe-stem-canker  charcoal-rot          charcoal-rot          rhizoctonia-root-rot
 [56] rhizoctonia-root-rot   phytophthora-rot       charcoal-rot          charcoal-rot          brown-stem-rot
 [61] powdery-mildew         powdery-mildew         powdery-mildew        powdery-mildew        downy-mildew
 [66] downy-mildew           downy-mildew           downy-mildew          phyllosticta-leaf-spot phyllosticta-leaf-spot
 [71] brown-spot             phyllosticta-leaf-spot brown-spot            brown-spot            brown-spot
 [76] brown-spot             bacterial-blight       bacterial-blight      downy-mildew          bacterial-blight
 [81] purple-seed-stain      purple-seed-stain      purple-seed-stain     purple-seed-stain     diaporthe-stem-canker
 [86] anthracnose            anthracnose            phyllosticta-leaf-spot phyllosticta-leaf-spot alternarialeaf-spot
 [91] alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot   alternarialeaf-spot   alternarialeaf-spot
 [96] alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot   alternarialeaf-spot   alternarialeaf-spot
[101] alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot   frog-eye-leaf-spot    phyllosticta-leaf-spot
[106] frog-eye-leaf-spot     frog-eye-leaf-spot     frog-eye-leaf-spot    frog-eye-leaf-spot    frog-eye-leaf-spot
15 Levels: alternarialeaf-spot anthracnose bacterial-blight bacterial-pustule brown-spot brown-stem-rot ... rhizoctonia-root-
rot
> # Create a confusion matrix
> predictions <- as.factor(predictions)
> testing_data$Class<-as.factor(testing_data$Class)
```

```
Overall Statistics

               Accuracy : 0.6909
                 95% CI : (0.5957, 0.7755)
    No Information Rate : 0.1636
    P-Value [Acc > NIR] : < 2.2e-16

                  Kappa : 0.6612

 Mcnemar's Test P-Value : NA

Statistics by Class:

                     Class: alternarialeaf-spot Class: anthracnose Class: bacterial-blight Class: bacterial-pustule
Sensitivity                              1.0000            0.37500                 1.00000                  0.250000
Specificity                              0.9022            1.00000                 0.98113                  1.000000
Pos Pred Value                           0.6667            1.00000                 0.66667                  1.000000
Neg Pred Value                           1.0000            0.95327                 1.00000                  0.972477
Prevalence                               0.1636            0.07273                 0.03636                  0.036364
Detection Rate                           0.1636            0.02727                 0.03636                  0.009091
Detection Prevalence                     0.2455            0.02727                 0.05455                  0.009091
Balanced Accuracy                        0.9511            0.68750                 0.99057                  0.625000
                     Class: brown-spot Class: brown-stem-rot Class: charcoal-rot Class: diaporthe-stem-canker
Sensitivity                    0.38889              0.25000            1.00000                      1.00000
Specificity                    1.00000              1.00000            0.96226                      0.97170
Pos Pred Value                 1.00000              1.00000            0.50000                      0.57143
Neg Pred Value                 0.89320              0.94444            1.00000                      1.00000
Prevalence                     0.16364              0.07273            0.03636                      0.03636
Detection Rate                 0.06364              0.01818            0.03636                      0.03636
Detection Prevalence           0.06364              0.01818            0.07273                      0.06364
Balanced Accuracy              0.69444              0.62500            0.98113                      0.98585
                     Class: downy-mildew Class: frog-eye-leaf-spot Class: phyllosticta-leaf-spot Class: phytophthora-rot
Sensitivity                      1.00000                  0.50000                       1.00000                 1.00000
Specificity                      0.99057                  1.00000                       0.89623                 0.98113
Pos Pred Value                   0.80000                  1.00000                       0.26667                 0.66667
Neg Pred Value                   1.00000                  0.91089                       1.00000                 1.00000
Prevalence                       0.03636                  0.16364                       0.03636                 0.03636
Detection Rate                   0.03636                  0.08182                       0.03636                 0.03636
Detection Prevalence             0.04545                  0.08182                       0.13636                 0.05455
Balanced Accuracy                0.99528                  0.75000                       0.94811                 0.99057
                     Class: powdery-mildew Class: purple-seed-stain Class: rhizoctonia-root-rot
Sensitivity                        1.00000                 1.00000                     1.00000
Specificity                        0.98113                 1.00000                     1.00000
Pos Pred Value                     0.66667                 1.00000                     1.00000
Neg Pred Value                     1.00000                 1.00000                     1.00000
Prevalence                         0.03636                 0.03636                     0.03636
Detection Rate                     0.03636                 0.03636                     0.03636
Detection Prevalence               0.05455                 0.03636                     0.03636
Balanced Accuracy                  0.99057                 1.00000                     1.00000
```

```
> predictions <- predict(nb_model, newdata = testing_data)
> predictions
  [1] diaporthe-stem-canker  diaporthe-stem-canker  charcoal-rot           charcoal-rot           rhizoctonia-root-rot
  [6] rhizoctonia-root-rot   phytophthora-rot       phytophthora-rot       phytophthora-rot       charcoal-rot
 [11] charcoal-rot           brown-stem-rot         powdery-mildew         powdery-mildew         alternarialeaf-spot
 [16] phyllosticta-leaf-spot phyllosticta-leaf-spot phyllosticta-leaf-spot phyllosticta-leaf-spot phyllosticta-leaf-spot
 [21] phyllosticta-leaf-spot brown-spot             alternarialeaf-spot    brown-spot             bacterial-blight
 [26] bacterial-blight       bacterial-blight       bacterial-pustule      phytophthora-rot       anthracnose
 [31] phytophthora-rot       diaporthe-stem-canker  diaporthe-stem-canker  phyllosticta-leaf-spot phyllosticta-leaf-spot
 [36] alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot
 [41] alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot    frog-eye-leaf-spot
 [46] frog-eye-leaf-spot     alternarialeaf-spot    alternarialeaf-spot    phyllosticta-leaf-spot frog-eye-leaf-spot
 [51] diaporthe-stem-canker  diaporthe-stem-canker  charcoal-rot           charcoal-rot           rhizoctonia-root-rot
 [56] rhizoctonia-root-rot   phytophthora-rot       charcoal-rot           charcoal-rot           brown-stem-rot
 [61] powdery-mildew         powdery-mildew         powdery-mildew         powdery-mildew         downy-mildew
 [66] downy-mildew           downy-mildew           downy-mildew           phyllosticta-leaf-spot phyllosticta-leaf-spot
 [71] brown-spot             phyllosticta-leaf-spot brown-spot             brown-spot             brown-spot
 [76] brown-spot             bacterial-blight       bacterial-blight       downy-mildew           bacterial-blight
 [81] purple-seed-stain      purple-seed-stain      purple-seed-stain      purple-seed-stain      diaporthe-stem-canker
 [86] anthracnose            anthracnose            phyllosticta-leaf-spot phyllosticta-leaf-spot alternarialeaf-spot
 [91] alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot
 [96] alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot
[101] alternarialeaf-spot    alternarialeaf-spot    alternarialeaf-spot    frog-eye-leaf-spot     phyllosticta-leaf-spot
[106] frog-eye-leaf-spot     frog-eye-leaf-spot     frog-eye-leaf-spot     frog-eye-leaf-spot     frog-eye-leaf-spot
15 Levels: alternarialeaf-spot anthracnose bacterial-blight bacterial-pustule brown-spot brown-stem-rot ... rhizoctonia-root-
rot
```