Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 308-317 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

Expert System for Early Detection of Disease in Corn Plant Using Naive Bayes Method

Budianto[1], Iskandar Fitri[2], and Winarsih[3]

[123]Fakultas Teknologi Komunikasi dan Informatika,
Universitas Nasional, Sawo Manila, RT.14/RW.3, Ps. Minggu, Kec. Ps. Minggu, Kota Jakarta Selatan, Daerah Khusus Ibu Kota Jakarta

E-mail: [1]budiianto24@gmail.com, [2]tektel2001@yahoo.com, [3]winarsih@civitas.unas.ac.id

ARTICLE INFO

Article history:
Received: 26/01/2020
Revised: 30/ 01/2020
Accepted: 01/02/2020

Keywords:
Expert System, Corn Disease, Naive Bayes, Early Detection

ABSTRACT

Corn is a third main plant after the paddies and squeeze in the world, and occupied a second position after the paddies in indonesia. Corn grows both good in the hot areas and cold with the rainfall and irrigation. But it's often dealing with a corn peasants Other than the pest is less information about the disease that attacked corn plants so that cause productivity becomes reduced. The expert - based expert system that has been built with framework php is the codeigniter and MySQL As the databases and methods used in detecting initial disease on the corn plant is Naïve Bayes. The result in the probation is a prodial by a disease on the corn plant is being used as a probe for decision for the farmers'decision. The system that has been built is expected to help the peasants in determine and Choose the right handling and according to the level of 92% of the system.

1. Introduction

Corn plants do not need large amounts of water, which is what makes corn an agricultural commodity that can be used as a staple food besides rice. In Indonesia, agricultural workers who are experts in the field of maize plant diseases are still limited, both in terms of number and working time. While the disease problems that arise are not a few of the corn farmers who make mistakes in overcoming problems about the disease.

The number of diseases in maize plants can make corn farmers confused in determining or choosing the type of treatment by the disease of the corn plant [1]. The handling of plant disease is necessary and will be effective if based on a causal agreement [2]. Increased crop productivity can compete with increasing local or export markets which are opportunities for Indonesian farmers [3]. Increased agricultural production is obtained through learning agricultural knowledge and knowledge about plant diseases [4]. However, the problem that arises is that without involving the owner directly, many plants are damaged because they are not well taken care of and are also resolved due to disease [5]. The existence of diseases that also attack crops can prevent losses for farmers who own agriculture [6]. Therefore, experts are needed or experts in agriculture to help farmers [7]. An expert is a person who has expertise in a particular field that is knowledge or special abilities in a particular field [8]. Although an expert is someone who is an expert in his expertise, in reality, an expert has limited memory and working stamina [9]. Also, the absence of experts and the high cost of consultation in an area also becomes an obstacle for farmers in finding solutions to the problems they face [10]. Created an expert system to facilitate farmers in solving problems appropriately without having to come to the experts directly [11]. Expert systems are systems that try to adopt human knowledge into computers so that computers can solve problems as can be done by experts [12]. In expert systems, there are many methods for determining the accuracy of system predictions [13]. Naive Bayes method is one of the machine learning methods that is often used [14]. Naive Bayes is a statistical classification that can be used to predict the

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 308-317 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

probabilities of certain classes [15]. Naïve Bayes is proven to have high accuracy when applied in expert systems [16]. Calculations using the Naive Bayes method are obtained from the probability value of symptoms, disease, and rules for the sample [17]. Naive Bayes has the disadvantage that if the conditional probability is zero, then the predicted probability will be zero [18].

The purpose of this study is an expert system that is useful to help corn farmers in knowing the types of corn crop diseases and how to deal with the problems of corn crop diseases to reduce the mistakes of corn farmers and the risk of crop failure can be reduced. In this research, an early detection system for maize disease was developed.

2. Research methods

In writing this expert system, the author first described the research framework so that it is easy to understand.

2.1 Naive Bayes Method

Naive Bayes is a simple probabilistic classification that calculates a set of probabilities by adding up the frequency and combination of values from an existing dataset.

Calculation of the Naive Bayes method can be done by finding the posterior value of each existing class by using equations.

$$P\ (A|B) = \frac{P(B|A)\,P(A)}{P(B)} \quad (1)$$

Information:
P (A | B) is the probability of event A if hypothesis B.
P (B | A) is the probability of B if a known type of A disease occurs.
P (A) is the probability of occurrence of disease A.
P (B) is the probability of hypothesis B regardless of any event.

2.2 Expert System Application Design

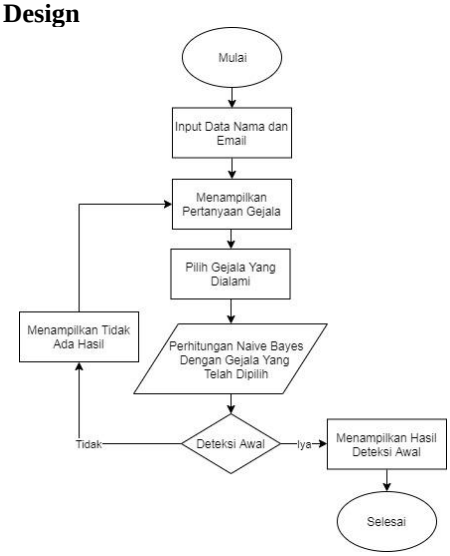

Figure 1. Flowchart expert system application

In Figure 1 the system displays questions and symptoms which will then be selected by the user according to the symptoms experienced. Furthermore, the choice of symptoms by the user will process, if the results of the solution for the disease do not exist then it will be directed to the question and choice of symptoms page. If a disease detection is found, the system will display the detection results of the symptoms and the disease.

2.3 Usecase Diagram

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 308-317 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

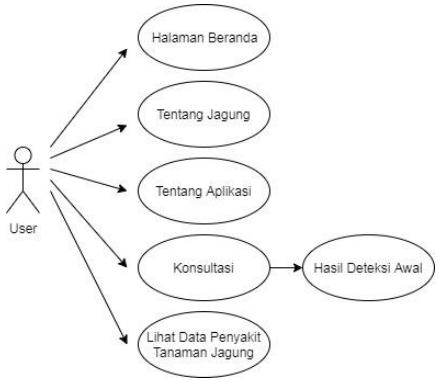

Figure 2. User usecase diagram

In Figure 2 the user can see the Home page, About Corn, About Application, Data on Corn Plant disease and Consultation by inputting symptoms of corn plant disease experienced and then the symptoms will be processed and displayed the results of the initial detection.

3. Result and Discussion

3.1 Data collection

Based on the results of data collection, 2 data classifications are consisting of corn plant disease data and corn plant disease symptom data obtained from the Ministry of Agriculture and other data sources, then these data are grouped into three data tables, namely table 1, table 2 and table 3 [19] [20].

Corn plants do not need large amounts of water, which is what makes corn an agricultural commodity that can be used as a staple food besides rice. In Indonesia, agricultural workers who are experts in the field of maize plant diseases are still limited, both in terms of number and working time. While the disease problems that arise are not a few of the corn farmers who make mistakes in overcoming problems about the disease.

TABLE 1
CORN PLANT DISEASE

Kode	Penyakit
P01	Bulai
P02	Hawar daun
P03	Karat daun
P04	Busuk pelepah
P05	Penyakit gosong

In table 1 there are 5 types of diseases in maize plants that use the initials P as a code for maize disease.

TABLE 2
SYMPTOMS OF CORN PLANT DISEASE

Kode	Gejala
G1	Daun berwarna khlorotik/pucat
G2	Mengalami hambatan pertumbuhan
G3	Warna putih seperti tepung dipermukaan atas dan bawah daun yang berwarna khlorotik
G4	Daun menggulung dan terpuntir
G5	Pembentukan tongkol terganggu
G6	Daun yang terserang tampak layu
G7	Beberapa bercak kecil bersatu membentuk bercak yang lebih besar
G8	Bercak berwarna coklat muda memanjang berbentuk kumparan atau perahu
G9	Bercak coklat berbentuk menyerupai elips
G10	Daun tampak kering
G11	Bercak-bercak kecil berwarna coklat atau kuning pada permukaan daun
G12	Bercak kemerahan pada pelepah

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 308-317 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

Kode	Gejala
G13	Terdapat benang-benang berbentuk tak beraturan berwarna putih kemudian coklat
G14	Keluar serbuk seperti tepung berwarna coklat kekuningan
G15	Pembengkakan pada tongkol
G16	Terdapat cendawan putih hingga kehitaman pada biji
G17	Biji membengkak
G18	Terbentuk kelenjar pada biji
G19	Kelobot terbuka dan muncul banyak cendawan berwarna putih hingga kehitaman

In table 2 there are symptoms of diseases that attack corn plants, there are 19 types of disease symptoms that use the initial G as a symptom of corn plant disease symptoms.

TABLE 3
CORN PLANT DISEASE

IF	THEN
G1, G2, G3, G4, G5	Bulai
G6, G7, G8, G9, G10	Hawar daun
G7, G10, G11, G14	Karat daun
G7, G12, G13	Busuk pelepah
G15, G16, G17, G18, G19	Penyakit gosong

Table 3 is a rule data table obtained from the Ministry of Agriculture which will be used as a basic reference for the system for diagnosing corn plant diseases. Then the system will display disease data by the symptoms entered by the user.

3.2 Manual Calculation Analysis

In this case, a user test was performed by inputting symptoms of corn plant disease, Karat daun.

TABLE 4
SAMPLE CASE

Kode Gejala	Jawaban	Kode Gejala	Jawaban
G1	Tidak	G11	Ya
G2	Tidak	G12	Tidak
G3	Tidak	G13	Tidak
G4	Tidak	G14	Ya
G5	Tidak	G15	Tidak
G6	Tidak	G16	Tidak
G7	Ya	G17	Tidak
G8	Tidak	G18	Tidak
G9	Tidak	G19	Tidak
G10	Ya		

After inputting the symptoms of corn disease, then the next calculation is done using the Naive Bayes method as follows:

3.2.1 Calculate the Number of Class P(A)

TABLE 5
CALCULATION OF THE NUMBER OF CLASSES

Jumlah *Class* (A = Penyakit)	
P(A = Bulai)	10/44 = 0.227
P(A = Hawar Daun)	10/44 = 0.227
P(A = Karat Daun)	8/44 = 0.181
P(A = Busuk Pelepah)	6/44 = 0.136
P(A = Penyakit Gosong)	10/44 = 0.227

In table 5 is a calculation on the training data where each training data per disease is divided by the total training data for all diseases, amounting to 44.

3.2.2 Calculate the Same Number of Answers in the Same Class as the P(B|A) Formula

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 308-317 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

TABLE 6
CALCULATION OF EACH CLASS

Daun berwarna khlorotik/pucat	
G1	P(G1=Tidak | A=P01) = 5/10 = 0.5
	P(G1=Tidak | A=P02) = 9/10 = 0.9
	P(G1=Tidak | A=P03) = 7/8 = 0.875
	P(G1=Tidak | A=P04) = 5/6 = 0.833
	P(G1=Tidak | A=P05) = 9/10 = 0.9
Mengalami hambatan pertumbuhan	
G2	P(G2=Tidak | A=P01) = 5/10 = 0.5
	P(G2=Tidak | A=P02) = 9/10 = 0.9
	P(G2= Tidak | A=P03) = 7/8 = 0.875
	P(G2= Tidak | A=P04) = 5/6 = 0.833
	P(G2= Tidak | A=P05) = 9/10 = 0.9
Warna putih seperti tepung dipermukaan atas dan bawah daun yang berwarna khlorotik	
G3	P(G3=Tidak | A=P01) = 5/10 = 0.5
	P(G3=Tidak | A=P02) = 9/10 = 0.9
	P(G3=Tidak | A=P03) = 7/8 = 0.875
	P(G3=Tidak | A=P04) = 5/6 = 0.833
	P(G3=Tidak | A=P05) = 9/10 = 0.9
Daun menggulung dan terpuntir	
G4	P(G4=Tidak | A=P01) = 5/10 = 0.5
	P(G4=Tidak | A=P02) = 9/10 = 0.9
	P(G4=Tidak | A=P03) = 7/8 = 0.875
	P(G4=Tidak | A=P04) = 5/6 = 0.833
	P(G4=Tidak | A=P05) = 9/10 = 0.9
Pembentukan tongkol terganggu	
G5	P(G5=Tidak | A=P01) = 5/10 = 0.5
	P(G5=Tidak | A=P02) = 9/10 = 0.9
	P(G5=Tidak | A=P03) = 7/8 = 0.875
	P(G5=Tidak | A=P04) = 5/6 = 0.833
	P(G5=Tidak | A=P05) = 9/10 = 0.9
Daun yang terserang tampak layu	
G6	P(G6=Tidak | A=P01) = 9/10 = 0.9
	P(G6=Tidak | A=P02) = 5/10 = 0.5
	P(G6=Tidak | A=P03) = 7/8 = 0.875
	P(G6=Tidak | A=P04) = 5/6 = 0.833
	P(G6=Tidak | A=P05) = 9/10 = 0.9
Beberapa bercak kecil bersatu membentuk bercak yang lebih besar	
G7	P(G7=Iya | A=P01) = 1/10 = 0.1
	P(G7=Iya | A=P02) = 5/10 = 0.5
	P(G7=Iya | A=P03) = 4/8 = 0.5
	P(G7=Iya | A=P04) = 3/6 = 0.5
	P(G7=Iya | A=P05) = 1/10 = 0.1
Bercak berwarna coklat muda memanjang berbentuk kumparan atau perahu	
G8	P(G8=Tidak | X=P01) = 9/10 = 0.9
	P(G8=Tidak | X=P02) = 5/10 = 0.5
	P(G8=Tidak | X=P03) = 7/8 = 0.875
	P(G8=Tidak | X=P04) = 5/6 = 0.833
	P(G8=Tidak | X=P05) = 9/10 = 0.9
Bercak coklat berbentuk menyerupai elips	
G9	P(G9=Tidak | X=P01) = 9/10 = 0.9
	P(G9=Tidak | X=P02) = 5/10 = 0.5
	P(G9=Tidak | X=P03) = 7/8 = 0.875
	P(G9=Tidak | X=P04) = 5/6 = 0.833
	P(G9=Tidak | X=P05) = 9/10 = 0.9
Daun tampak kering	
G10	P(G10=Iya | X=P01) = 1/10 = 0.1
	P(G10=Iya | X=P02) = 5/10 = 0.5
	P(G10=Iya | X=P03) = 4/8 = 0.5
	P(G10=Iya | X=P04) = 1/6 = 0.166
	P(G10=Iya | X=P05) = 1/10 = 0.1
Bercak-bercak kecil berwarna coklat atau kuning pada permukaan daun	
G11	P(G11=Iya | X=P01) = 1/10 = 0.1
	P(G11=Iya | X=P02) = 1/10 = 0.1
	P(G11=Iya | X=P03) = 4/8 = 0.5
	P(G11=Iya | X=P04) = 1/6 = 0.166
	P(G11=Iya | X=P05) = 1/10 = 0.1
Bercak kemerahan pada pelepah	
G12	P(G12=Tidak | X=P01) = 9/10 = 0.9
	P(G12=Tidak | X=P02) = 9/10 = 0.9
	P(G12=Tidak | X=P03) = 7/8 = 0.875
	P(G12=Tidak | X=P04) = 3/6 = 0.833
	P(G12=Tidak | X=P05) = 9/10 = 0.9
Terdapat benang-benang berbentuk tak beraturan berwarna putih kemudian coklat	
G13	P(G13=Tidak | X=P01) = 9/10 = 0.9
	P(G13=Tidak | X=P02) = 9/10 = 0.9
	P(G13=Tidak | X=P03) = 7/8 = 0.875
	P(G13=Tidak | X=P04) = 3/6 = 0.833
	P(G13=Tidak | X=P05) = 9/10 = 0.9
Keluar serbuk seperti tepung berwarna coklat kekuningan	
G14	P(G14=Iya | X=P01) = 1/10 = 0.1
	P(G14=Iya | X=P02) = 1/10 = 0.1
	P(G14=Iya | X=P03) = 7/8 = 0.875
	P(G14=Iya | X=P04) = 1/6 = 0.166
	P(G14=Iya | X=P05) = 1/10 = 0.1
Pembengkakan pada tongkol	
G15	P(G15=Tidak | X=P01) = 9/10 = 0.9
	P(G15=Tidak | X=P02) = 9/10 = 0.9
	P(G15=Tidak | X=P03) = 7/8 = 0.875
	P(G15=Tidak | X=P04) = 5/6 = 0.833
	P(G15=Tidak | X=P05) = 5/10 = 0.5

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 308-317 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

Terdapat cendawan putih hingga kehitaman pada biji	
G16	P(G16=Tidak | X=P01) = 9/10 = 0.9
	P(G16=Tidak | X=P02) = 9/10 = 0.9
	P(G16=Tidak | X=P03) = 7/8 = 0.875
	P(G16=Tidak | X=P04) = 5/6 = 0.833
	P(G16=Tidak | X=P05) = 5/10 = 0.5
Biji membengkak	
G17	P(G17=Tidak | A=P01) = 9/10 = 0.9
	P(G17=Tidak | A=P02) = 9/10 = 0.9
	P(G17=Tidak | A=P03) = 7/8 = 0.875
	P(G17=Tidak | A=P04) = 5/6 = 0.833
	P(G17=Tidak | A=P05) = 5/10 = 0.5
Terbentuk kelenjar pada biji	
G18	P(G18=Tidak | A=P01) = 9/10 = 0.9
	P(G18=Tidak | A=P02) = 9/10 = 0.5
	P(G18=Tidak | A=P03) = 7/8 = 0.875
	P(G18=Tidak | A=P04) = 5/6 = 0.833
	P(G18=Tidak | A=P05) = 5/10 = 0.5
Kelobot terbuka dan muncul banyak cendawan berwarna putih hingga kehitaman	
G19	P(G19=Tidak | A=P01) = 9/10 = 0.9
	P(G19=Tidak | A=P02) = 9/10 = 0.9
	P(G19=Tidak | A=P03) = 7/8 = 0.875
	P(G19=Tidak | A=P04) = 5/6 = 0.833
	P(G19=Tidak | A=P05) = 5/10 = 0.5

In table 6 is a calculation of each symptom with each disease which results in a probability class whose results will be multiplied later.

3.2.3 Probability Results

TABLE 7
PROBABILITY RESULTS

Penyakit	Nilai
Bulai	0.0000002
Hawar Daun	0.0000201
Karat Daun	0.0015333
Busuk Pelepah	0.0000074
Penyakit Gosong	0.0000002

In table 6 is a calculation of each symptom with each disease which results in a probability class whose results will be multiplied later.

3.3 Display Interface

Figure 3. Home page

In figure 3 is the initial appearance of the application that displays several menus that exist such as Introduction, About, Consultation, Disease and Contact.

Figure 4. The introduction Section

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 308-317 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

Figure 5 is part of the home page that explains corn plants such as pictures and information about corn plants, in addition, there is also a button to immediately start for consultation.

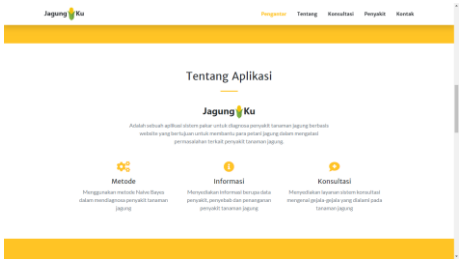

Figure 5. About the application Section

Figure 5 is also part of the home page that displays information about the application and the features that exist in the expert system application.

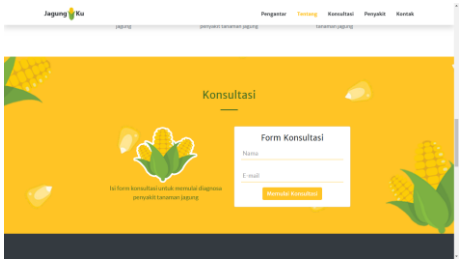

Figure 6. Form consultation section

In Figure 6 is also part of the home page to conduct a consultation that begins by filling out the consultation form such as name and email, they will be directed to the corn plant consultation page.

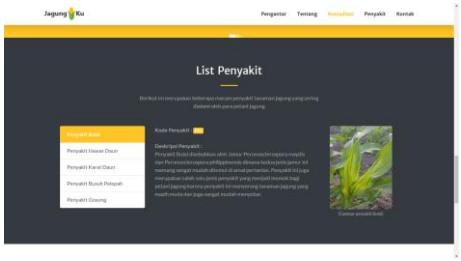

Figure 7. Disease list section

In Figure 7 is also part of the home page that displays information about maize plant diseases that exist in the application of the expert system for early detection of corn disease.

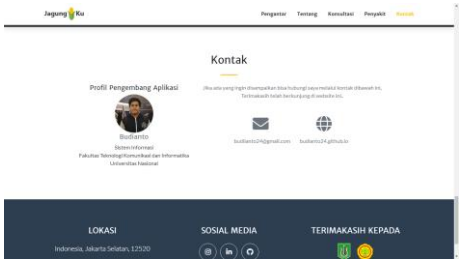

Figure 8. Profile and contact sections

Figure 8 is also part of the home page that displays the profile and contact of application developers such as email and social media.

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 308-317 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

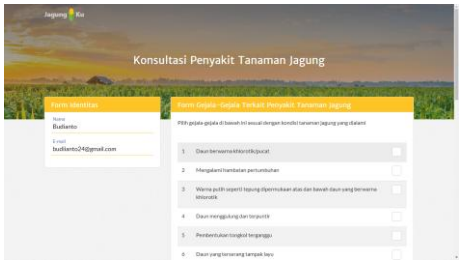

Figure 9. Consultation page

Figure 9 is a page to fill the symptoms of corn plant diseases experienced by the user who will then be processed by the system and calculated the probability of corn plant disease. Then it will be directed to the consultation results page.

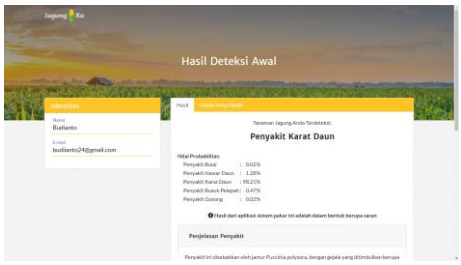

Figure 10. Consultation results page

Figure 11 is a page that displays information on what symptoms the user chooses and displays the percentage of maize plant diseases selected according to the user's input symptoms.

3.4 Expert System Accuracy Testing

In testing the accuracy of the system can be done using the formula:

$$Akurasi\ Sistem = \frac{\sum match}{\sum tp} \times 100\% \quad (2)$$

Information:
∑ match = Valid amount of data
∑ tp = The total amount of test data

TABLE 8
SYSTEM ACCURACY TESTING

No	Gejala	Pakar	Sistem	Ket
1	G1, G2, G3, G4, G5	Bulai	Bulai	✓
2	G6, G7, G8, G9, G10	Hawar Daun	Hawar Daun	✓
3	G7, G10, G11, G14	Karat Daun	Karat Daun	✓
4	G7,G12,G13	Busuk Pelepah	Busuk Pelepah	✓
5	G15, G16, G17, G18, G19	Penyakit Gosong	Penyakit Gosong	✓
6	G10	Karat Daun	Hawar Daun	□
7	G1, G2	Bulai	Bulai	✓
8	G2, G3, G4	Bulai	Bulai	✓
9	G8, G9, G10	Hawar Daun	Hawar Daun	✓
10	G10, G11	Karat Daun	Karat Daun	✓
11	G1, G3	Bulai	Bulai	✓
12	G15, G17, G19	Penyakit Gosong	Penyakit Gosong	✓
13	G8, G12, G13	Busuk Pelepah	Busuk Pelepah	✓
14	G5, G6, G7	Hawar Daun	Hawar Daun	✓
15	G10, G11, G12	Karat Daun	Karat Daun	✓
16	G14, G17, G18, G19	Penyakit Gosong	Penyakit Gosong	✓

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 308-317 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

No	Gejala	Pakar	Sistem	Ket
17	G12, G13, G14	Busuk Pelepah	Busuk Pelepah	✓
18	G1,G2, G18	Bulai	Bulai	✓
19	G12, G15, G16	Penyakit Gosong	Penyakit Gosong	✓
20	G8, G9, G14	Hawar Daun	Hawar Daun	✓
21	G7, G12, G19	Busuk Pelepah	Busuk Pelepah	✓
22	G7, G13	Busuk Pelepah	Busuk Pelepah	✓
23	G14, G15, G16	Penyakit Gosong	Penyakit Gosong	✓
24	G7	Karat Daun	Hawar Daun	□
25	G18, G19	Penyakit Gosong	PenyakitGosong	✓

In table 8 of the results of testing the system tested 25 times, producing 23 valid data according to experts and 2 invalid data. Then the great accuracy of the expert system is:

$$\text{System accuracy} = \frac{23}{25} \times 100\% = 92\% \quad (2)$$

So the accuracy obtained in system testing is 92%.

4. Conclusion

Based on the discussion carried out in the previous chapter related to the creation of an expert system application for early detection of maize plant diseases using the Naive Bayes method, the following conclusions can be drawn:

a. With the application of an expert system of early detection of maize plant diseases, it is easy for users to find out the diseases suffered by maize plants early by inputting the symptoms of maize plant diseases experienced. The results of this expert system application are in the form of suggestions in the form of information on corn plant diseases and how to handle the disease.
b. The level of application system accuracy obtained from the system accuracy testing data using the Naive Bayes method is 92%.
c. The discrepancy between the results of the system and the experts is because the selected symptoms are owned by some maize plant diseases so the system for detecting maize plant diseases is less specific.

5. References

[1] H. T. Sihotang, "Sistem Pakar Untuk Mendiagnosa Penyakit Pada Tanaman Jagung Dengan Metode Bayes," *Journal Of Informatic Pelita Nusantara*, vol. 3, no. 1, 2018.

[2] I. P. Astuti, I. Hermadi, A. Buono and K. H. Mutaqin, "Pengembangan Sistem Pakar Identifikasi Awal Penyakit Kedelai Dengan Pendekatan Naive Bayes Berbasis Android," *Jurnal Pustakawan Indonesia*, vol. 14, no. 2, 2017.

[3] M. T. Effendi, N. Hidayat and R. K. Dewi, "Sistem Diagnosis Penyakit Tumbuhan Mangga Menggunakan Metode Naive Bayes," *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer*, vol. 3, no. 4, pp. 3896-3902, 2019.

[4] M. Syarief, A. M. Novi Prastiti and W. Setiawan, "Penerapan Metode Naive Bayes Classifier Untuk Deteksi Penyakit Tanaman Jagung," *Jurnal Ilmiah NERO*, vol. 3, no. 1, 2017.

[5] A. Setiawan, N. Hidayat and R. K. Dewi, "Sistem Pakar Diagnosis Penyakit Tanaman Cengkeh Menggunakan Metode Naive Bayes (Studi Kasus Kecamatan Wonosalam, Jombang)," *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer*, vol. 2, no. 10, pp. 4034-4038, 2018.

[6] L. Suada, "Sistem Pakar Identifikasi Hama Dan Penyakit Tanaman Tebu Menggunakan Metode Naive Bayes," 2017.

[7] Jaroji, A. H. Sianturi, M. and M. K. Nilam Sari, "Sistem Pakar Pedia Untuk Pertanian Indonesia Berbasis Android Dengan Menerapkan Metode Naive Bayes," *Jurnal Sistem Informasi*, vol. 8, no. 3, 2019.

[8] A. A. Muslim, R. Arnie and Sushermanto, "Sistem Pakar Diagnosa Hama Dan Penyakit Cabai Berbasis Teorama Bayes," *JUSTISI*, vol. 4, no. 3, 2016.

Jurnal Mantik
Volume 3 Number 4, February 2020, pp. 308-317 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

[9] V. P. Dewa, A. Pujianto and M. H. Putra, "Sistem Pakar Diagnosa Penyakit Buah Nanas Menggunakan Algoritma Bayes Berbasis Web," *Seminar Nasional Teknologi Informasi dan Multimedia,* 2017.

[10] Hartatik and I. K. Putra Yasa, "Sistem Pakar Untuk Mendeteksi Hama Tanaman Jahe Menggunakan Teorama Bayes," *Jurnal Ilmiah DASI,* vol. 16, no. 2, 2016.

[11] D. N. Ilham, H. and R. A. Candra, "Analisa Perbandingan Penerapan Metode Bayes Dan Certainty Factor Untuk Mendiagnosa Penyakit Kakao," *Jurnal Manajemen Informatika & Komputerisasi Akuntansi,* vol. 3, no. 1, 2019.

[12] R. Ristandi, N. Hidayat and M. A. Fauzi, "Pemodelan Sistem Pakar Diagnosa Hama - Penyakit Pada Tanaman Bawang Merah Menggunakan Metode Naive Bayes," *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer,* 2018.

[13] A. Riswansyah, Sumiati, Harsiti and E. Safaah, "Diagnosa Hama Dan Penyakit Tanaman Padi Menggunakan Metode Bayes," *Seminar Nasional Riset Terapan,* 2017.

[14] K. Robindro, K. Nilakanta, A. Das and D. N. , "Decision Support System for Rice Plant Disease Diagnosis using Naïve Bayes' Algorithm," *International Journal of Scientific Research,* vol. 3, no. 7, 2017.

[15] A. D. Mengistu, D. M. Alemayehu and S. G. Mengistu, "Ethiopia Coffee Plant Diseases Recognition Base on Imaging and Machine Learning Techniques," *International Journal of Database Theory and Application,* vol. 9, no. 4, pp. 79-88, 2017.

[16] M. Nababan, Y. Laia, D. Sitanggang, O. Sihombing, E. Indra, S. Siregar, W. Purba and R. Mancur, "The diagnose of oil palm disease using Naive Bayes Method based on Expert System Technology," *Journal of Physics,* 2018.

[17] S. A. Pattekari and A. Parveen, "Prediction System For Heart Disease Using Naive Bayes," *International Journal of Advanced Computer and Mathematical Sciences,* vol. 3, no. 3, 2012.

[18] R. Kurniawan, N. Yanti, M. Z. Ahmad Narzi and Z. , "Expert Systems for Self-Diagnosing of Eye Diseases Using Naive Bayes," *International Conference of Advanced Informatics: Concept, Theory, and Applcation (ICAICTA),* 2014.

[19] W. Wakman and Burhanudin, Pengelolaan Penyait Prapanen Jagung, Balai Penelitian Tanaman Serelia, 2016.

[20] M. S. Sudjono, "Penyakit Jagung dan Pengendaliannya," Balai Penelitian Tanaman Pangan Bogor, Bogor, 2015.