IDENTIFICATION OF THE RACES OF DOWNY MILDEW OF SUNFLOWER IN THE PRINCIPAL SUNFLOWER PRODUCTION AREA OF JILIN PROVINCE

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Abstract

Four sunflower differentials, HA89, RS310, RHA274 and HA335, which were introduced from KWS, Germany, were used to identify the physiological races of the downy mildew of sunflower caused by Plasmopara halstedii (Farl.) Berl.and de Toni, which were collected from the sunflower fields in Baicheng City, Qian'an County and Nong'an County located in the principal sunflower production area of Jilin Province in 1994. The results showed that all of the races of the pathogen collected from different locations were identified as race 1 or the European Race.

Key-words: Sunflower, Downy mildew, Plasmopara halstedii, Race, Differential

Introduction

Downy mildew of sunflower caused by Plamopara halstedii (Farl.) Berl. and de Toni was firstly reported in Heilongjiang Province of China in 1963 by Liu Xiruo (1). Since then it has been found in Jilin, Liaoning , Xinjiang, Guizhou , Beijing, Shanxi and Inner Mongolia (2). Generally, about 5% sunflower plants were infected by the pathogen in the principal sunflower production area of Jilin Province. If the conditions were suitable for the disease to develop, the incidence would be more than 30%. For the disease is of systemic infection and almost causes no yields , the incidence means the percentage of the seed losses. The sunflower resistance to the disease is controlled by the single ,dominant genes so that the resistant breeding to the pathogen is the most effective and economic control measure. Many races exist in the pathogen populations in the world and more than 7 races have been reported (3, 4) . Identification of the races of the pathogen is the most basic work for the breeding for the resistance to the disease. The objective of the study was to identify races existing in the pathogen populations in the principal sunflower production area of Jilin Province.

Materials and methods

The trials were carried out in the plant pathological lab and greenhouse of Jilin Province Research Institute of Sunflower, at Baicheng of Jilin Province in 1994. The four differentials, HA89(Pl 0) , RS31(Pl 1), RHA274(Pl 2) and HA335(Pl 3-4, Pl 6), used in the study, were obtained from KWS of Germany and their reactions to the known races of the pathogen are shown in Table 1.

Table 1. Reactions of the sunflower differentials to the known races of Plasmopara halstedii.

Differen-tials	Race 1	Race 2	Race 3	Race 4	Race 5	Race 6	Race 7
HA 89	S	S	S	S	S	S	S
RS310	R	S	S	S	S	S	S
RHA274	R	R	S	S	S	S	R
HA335	R	R	R	R	R	R	R

R = Resistant
S = Susceptible

The pathogens for preparing the inocula for the study were obtained from the infected plants which were collected from the sunflower fields in Baicheng City , Qian'an County and Nong'an County of the province. The three city/counties are located in the principal sunflower production area. HA89 was used for multiplying the three pathogen populations. The zoosporangia were washed and collected with the sterilized water from the fresh infected sunflower leaves for making the zoosporagium suspension(40 000 - 100 000 zoosporangia/ml) with the sterilized water. The germinated seeds of HA89 with the radicle longth of 1-2 mm were immersed in such prepared suspension contained in the dishes for the inoculation. Then the dishes were put in the growth chamber with the temperature of 18 C and no light for 4-5 hours. The inoculated seeds were planted in the small pots containing the pearlite materials and then were placed in the plant growth chamber with the temperature of 18 C and light period of 14 hours for two weeks. Twelve days after planting , the seedlings were covered with the plastic bags for 2 days for keeping the moisture to produce more zoosporangia. Then the same process should be done again for the multiplication.

All differentials were inoculated with the three populations , respectively , in the same way with the pathogen multiplications in the study. But the inoculated differential seeds were planted in the big pots containing the mixture(silt : pearlite = 1 : 1). The pots were placed in the greenhouse with the temperature of 18-20 C and the relative humidity more than 80%. There were 10 plants kept in each pot as a treatment, meaning that one differential was inoculated with one pathogen population. Each treatment was replicated for 10 times. The average incidence of the plants of the 10 replicates in each treatment was checked 3 weeks after planting.

Results and discussion

The reactions of the sunflower differentials to the three pathogen populations are shown in Table 2. The results indicated that the differentials made the similar response to the

Table 2. Reactions of the four sunflower differentials to the three populations of Plasmopara halstedii from Baicheng , Qian'an and Nong'an

Pathogen populations	Differentials	No. of plants examined	No. of plants infected	Incidence (%)	Resistance reaction
Baicheng	HA89	100	100	100	S
	RS310	100	0	0	R
	RHA274	98	0	0	R
	HA335	100	0	0	R
Qian'an	HA89	100	100	100	S
	RS310	97	0	0	R
	RHA274	99	0	0	R
	HA335	100	0	0	R
Nong'an	HA89	100	100	100	S
	RS310	100	0	0	R
	RHA274	100	0	0	R
	HA335	98	0	0	R

R = Resistant
S = Susceptible

three pathogen populations or that HA89 has no resistant genes so was infected by the three populations and the other differentials have the resistant genes Pl 1, Pl 2, and Pl 3-4, 6, respectively, and made resistant reactions to the populations. In line with the reactions of the differentials to the known races, the three populations of the pathogen were identified as race 1 or the European race. Because the three city/counties in which the pathogen populations were collected are located in the different locations and represent the principal sunflower production area of the province, the races in the area were race 1. The reason that the situation exist was that the farmers have grown the variety "Hungary 4" introduced from Europe for years.

The breeders should consider transferring the resistant genes into the local varieties in their breeding program to control the disease.

Literatures cited

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