T1988CROP35

THE OBSERVATIONS ON THE DEVELOPMENT OF THE PERITHECIAL STAGE IN DIAPORTHE HELIANTHI Munt.-Cvet.

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SUMMARY

In its development cycle, Diaporthe helianthi goes through the pycnidial stage, with alpha and beta spores (conidia), in the first year. Perithecia develop on overwintered infected parts of sunflower stem in the second year. Alpha conidia are developed by a few isolates of the second year. Alpha conidia are developed by all isolates and their number is large. The number of beta conidia is especially large at the beginning of the perithecial stage and it decreases as the number of newly formed perithecia increases. It appears that beta conidia play an important role in the development of perithecia of Diaporhe helianthi. There is evidently a correlation between beta conidia and the development of perithecia because it explains the large number of beta conidia and their role in the life cycle of the fungus.

INTRODUCTION

It is known that Diaporthe helianthi has in its developmental cycle the asexual (pycnidial) and the sexual (perithecial) stage. The asexual stage takes place in infected plant parts in the course of vegetation and in pure culture. The perithecial stage takes place only on overwintered infected parts of sunflower stalk (Aćimović, Štraser, 1981; Aćimović, 1983).

The perithecial stage begins by the fusion of haploid plus and minus hyphae resulting in a diploid hypha followed by the perithecial stage. Having studied the development of D.helianthi perithecia for several years, we found that the number of beta conidia increases considerably just before the occurrence of perithecia and then it gradually decreases. We concluded that beta conidia probably play a similar role in the formation of the perithecial stage as plus and minus hyphae.

MATERIALS AND METHODS

In the period from 1981 to 1986, pure cultures of Diaporthe helianthi were grown on PDA and naturally infected sunflower stalks were left each fall to overwinter in field at soil surface, 5 and 10 cm under the soil surface.

Checks were performed at 15-day intervals, starting in the fall of one year and finishing the cycle the next fall, just before sunflower harvest.

RESULTS

There were no changes on the pure cultures. Mycelia, pycnidia, and beta conidia were found on them, but never perithecia. In spring, perithecia developed first on the infected stalks buried at the depth of 5 cm and afterwards on the above-ground parts. Perithecia did not develop on the stalk buried at 10 cm but when they were retrieved and left on soil surface, perithecia developed in 10 days. These results were obtained on a chernozem soil. On the soils of poorer structure, smonitza soils and the like, perithecia developed only on the infected parts left on soil surface, the samples buried at the depth of 5 cm usually rotted leaving no room for the development of perithecia. In addition to soil type, climatic conditions also tended to affect the formation of perithecia. In 1982, first mature perithecia were observed in field at the end of March. In the other years, perithecia were observed much later, usually in May and June. But, after the occurrence of first perithecia in spring, new perithecia continued to develop, if favorable climatic conditions permitted, till sunflower harvest, i.e., till the end of September. This dynamic of perithecial development wasobserved in 1979, 1980, 1981, and 1982, i.e., in the years of epiphytotic attacks of this disease. The occurence and number of perithecia depended on temperature, rainfall, and soil humidity.

It was found that the development of perithecia may be accelerated by taking overwintered infected plant parts to the laboratory and placing them in a wet chamber. Perithecia developed in 7-17 days, depending on temperature.

Regular microscopic controls showed that the number of beta conidia increased immediately before the occurrence of perithecia to gradually decrease afterwards. It appears that the number ofperithecia developed during sunflower vegetation is closely associated linked with the number of beta conidia. As the number of the latter decrased in the second part of vegetation, the number of perithecia decrased too.

In spring, before the occurence of first perithecia, a specific activity of beta conidia was observed. They tended to come close to each other, usually in pairs and seldom in larger groups. Perithecia would occur after that.

It seems that there exist haploid plus and minus conidia, which apparently produce diploid hyphae which in its turn produces the perithecial stage. It is certain that beta conidia play a role in the development of perithecia, which explains the mass development of beta conidia.

DISCUSSION

It has been proved beyond doubt that the imperfect pycnidial stage of Diaporthe helianthi, with a large number of beta conidia, develops on the infected sunflower plants in field and in pure culture on PDA. Isolates have both alpha and beta conidia occurred only exceptionally. The fungus forms the perfect perithecial stage only on overwintered infected sunflower stalk. It is known that other species of Phomopsis, which attack different agricultural crops, are prolific in the development of beta conidia. Their role in the fungus development has not been satisfactorily explained. Our observations indicate that they do take part in the perithecial formation. Their number on overwintered infected sunflower stalks is highest in spring, just before the occurence of perithecia. It appears that two beta conidia fuse following the priciple one plus hypha and one minus hypha. The fungus develops perithecia successively during sunflower vegetation. However, their development virtually ceases when the number of beta conidia becomes critical, i.e., when there is practically no beta conidia on overwintered infected sunflower stalks.

CONCLUSION

Diaporthe helianthi overwinters on infected sunflower parts in the form of mycelia or pycnidia.

In the case of chernozem soil, Diaporthe helianthi may overwinter on soil surface, 5 cm and 10 cm under the soil surface.

In spring, first mature perithecia usually occur on infected harvest residues in late May and in June.

According to our observations, the development of perithecia is closely associated with beta conidia.

LITERATURE

Aćimović M., Štraser N. (1981), Phomopsis sp. - a new parasite in sunflower, Helia 4: 43-58.

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