Susceptible varieties

Soil

Symptoms: Root thickening and subsequent gall formation

For identification,

Due MATERIALS & METHOD and increasing varieties cultivate market yield.

In EUROPE

CHALLENGES FOR RESISTANCE BREEDING IN EUROPE

CLUBROOT AT A GLANCE

- Pathogen: Plasmodiophora brassicae
- Symptoms: Root thickening and subsequent gall formation
- Soil-borne disease of high importance for Brassica crops
- Prevalent on every continent
- Virulence of pathotypes differs against varying host plants
- Resistance breeding is a strong option for disease control

In Europe, high incidence of clubroot is noted in Central Europe, including Poland, Germany, France and Czech Republic. Infection causes yield reduction of 50 % and more. Introduction of clubroot resistant rapeseed cv. Mendel to the European market in 2000 helped farmers to cultivate rapeseed even on infested fields. Today’s new clubroot-resistant varieties possess better seed yield and agronomic characteristics and demonstrate the potential of plant breeding for a better control of the disease. Almost all commercial clubroot resistant rapeseed varieties carry the Mendel-resistance.

P. brassicae possesses 8 different pathotypes (according to Scoet et al. 1996). Resistance of Mendel is successful against P1, P2, P3 and P5. Cultivation of rising acreages of resistant varieties disclose increasing resistance breaks in Europe (ZAMM-NOON 2015). For successful breeding, monitoring and pathotype identification of P. brassicae is of high value.

MATERIALS & METHOD

Experiment 1: Monitoring of clubroot spreading

Farmers in Germany, Poland and Czech Republic took soil sample from their fields. At University of Rostock the bioassay was conducted under greenhouse conditions on 35 seedlings of susceptible B. napus (cv. Visby) used for each soil sample. Control plants were transplanted into pots filled with soil mix without resting spores. Symptoms were assessed after 6 weeks. Disease rating was recorded on a scale from 0 to 3, with 0 = no disease and 3 = main root heavily clubbed.

Experiment 2: Pathotype identification

Due to specific host-pathogen interaction it is possible to classify pathotypes. For pathotype identification, clubs of a resistant variety collected in South Germany were examined. From each club one pathogen suspension was produced. According to Scoet et al. 1996, B. napus cvs Nevin, Wilhelmsburger and Brutor were infected to identify the prevalent pathotype.

RESULTS

Experiment 1: Monitoring of clubroot spreading

In this study occurrence of clubroot infection in commercial fields was mapped for Germany, Poland and Czech Republic (Fig. 2). The map shows high clubroot infestation for North-East Germany, North and South-West Poland and North and Central of Czech Republic. For France clubroot monitoring is shown from the studies conducted by CETIOM.

Experiment 2: Pathotype identification

Example for presence of pathotype P3 according to Scoet et al. 1996 (Tab. 1). Cvs. Nevin and Wilhelmsburger show no clubbed roots but roots of cv. Brutor are highly damaged by P. brassicae.

DISCUSSION & CONCLUSION

Monitoring of clubroot disease spreading was carried out in Germany, Poland and Czech Republic. These results add to existing monitoring (DECKERHOFEN 2013, DIROK 2000, ZAMM-NOON 2015). Knowledge on geographic dispersion of clubroot is important due to ongoing expansion of the disease. Further studies will be necessary in the future.

Results of pathotype identification show, that plants were infected by P. brassicae pathotype P3. Infection of variety with Mendel-resistance implies, that the pathogen was able to break resistance. Today, we also find pathotypes which are declared as P1 or P3 but, however, can break Mendel-resistance as well (ZAMM-NOON 2015). These pathotypes are not observed by the differential set of Scoet et al. 1996. Integrating Mendel to this differential set would make future identification of pathotypes more precise.

Today, it is the challenge for European breeders to detect new sources of resistance against clubroot and to introduce them in new competitive rapeseed varieties. For better disease control, monitoring of clubroot and identification of P. brassicae pathotypes is of high importance.

REFERENCES


CONTACT
Benedikt Flecke // benedikt.flecke@syngenta.com // Zum Kirchenbach 20, 32357 Bad Salzuflen, Germany
Undersowing oilseed rape with various crop mixtures: what benefits for farmers?

A. Baux1, S. Breitenmoser1, N. Courtois2

1Agroscope, Route de Duillier 50, 1260 Nyon, Switzerland
2Agrigenève, Rue des Sablières 15, 1242 Satigny, Switzerland

Oilseed rape (OSR) is the first oilseed produced in Switzerland. It is well adapted to the Swiss climate and is considered as an important crop. Its production is intensive with high fertilization and crop protection. However, in Switzerland, nitrogen fertilization is limited within the farm and the will to reduce phytosanitary treatment led to new subsidies for crop management without herbicides, insecticides or fungicides. Intercropping OSR with various living mulches was tested as a solution to reduce fertilization and pesticides. Various mixtures, consisting of frost-sensitive or frost-tolerant, legumes or non-legume species, were tested on farm since 2011. Weed cover and yield were registered during 6 years. An additional experiment in a split plot design was set up to assess the impact of these associations on pest damages and nitrogen nutrition. The plants were grown with no insecticide and only the control plots were treated with herbicide. Fertilization level were either “normal”, calculated with the “réglette azote”, or reduced.

The variability among years was large for all the measured parameter, and the differences among treatments were seldom significant. Competition between OSR and additional species resulted in lower OSR biomass in winter, but this was compensated in spring, and did not lead to any yield reduction. Adult flea beetles caused slightly more damages on the cotyledons and the first leaves of sole OSR, but no significant difference could be found among treatments for the amount of larvae per plant, more related to the total OSR biomass in autumn. Finally, the reduction of nitrogen fertilization did not result in significant yield loss in most years. However, our data showed that the yield gap between high and low fertilization was generally reduced when OSR was sown with companion plants, especially when the mixture consist of a majority of legumes.

Growing OSR as a sole crop or with companion plants led to very similar yields. In most years, undersowing allowed OSR to reach satisfactory grain yield in spite of pesticides and fertilization reduction. In the practice, this technique is booming in Switzerland, promoted by the agricultural policy. Nevertheless, more knowledge is still needed to define long term benefits of undersowing, and propose a better adapted management system.

Keywords: oilseed rape, intercropping, living mulches, nitrogen fertilization, flea beetle, low-input cropping systems