

IMPROVING CHOCOLATE SPOT RESISTANCE IN FABBA (FIELD) BEANS

As part of the PCGIN research programme, NIAB seeks to improve sources of durable disease resistance in faba bean (*Vicia faba*) targeting three major faba bean diseases: chocolate spot (*Botrytis fabae*), downy mildew (*Peronospora viciae* f sp *fabae*) and foot rot (caused by a complex of *Fusarium culmorum*, *F. solani*, *Didymella pinoides*).

NIAB maintains a collection of >1,000 faba bean varieties; a number have been screened for disease resistance. Novel sources of disease resistance have been identified for the three major pathogens; mapping populations for identifying the genes responsible have been developed for each disease. This could help future faba bean breeding programmes develop resistant varieties.



Chocolate spot on susceptible faba beans



Irrigated, inoculated trials screening for chocolate spot resistance

Table 1. Significant association identified in Maris Bead in three field trials

Year	Days after inoculation	Chromosome	Significance	Variance accounted
2017	15	3	0.05	0.15
2017	19	6	0.01	0.15
2017	26	6	0.01	0.14
2019	10	2	0.05	0.14
2019	3	3	0.01	0.16
2021	32	1	0.05	0.14
2021	44	5	0.01	0.19

focus on NIAB research – chocolate spot

Initial symptoms of chocolate spot (*Botrytis fabae*) appear on the leaves as small chocolate-coloured lesions, but can quickly expand and coalesce, leading to rapid defoliation of plants when warm, humid conditions favour disease development. It can also affect the pods, reducing the quality of the seeds and spreading further infections.

Levels of genetic resistance in current elite varieties is relatively poor and growers rely on fungicides to control the pathogen when symptoms occur. Work at NIAB has been aimed at exploiting different sources of high partial resistance in the variety Maris Bead, and lines NV651 and NV685.

Inoculated, irrigated field trials initiate controlled epidemics to characterise the resistance in mapping population lines as disease develops progressively through the season. Resistant lines develop fewer symptoms than susceptible ones.

Genetic analyses indicate that chocolate spot resistance in Maris Bead is a complex trait potentially governed by multiple genes, at different times during development. A total of seven new genetic markers for resistance have been identified during screening in three independent field trials (Table 1). Genetic markers were observed to account for up to 19% of the variation in disease symptoms, and around 15% on average. These genetic markers have been shared with UK pulse breeders, enabling them to track regions of the genome associated with improved resistance to chocolate spot in Maris Bead.



The Pulse Crop Genetic Improvement Network (PCGIN) is a collaborative, Industry-focused network aimed towards developing improved pre-breeding genetic resources for supporting UK pulse breeders, funded by Defra.