

Finding favour for faba beans

Pulse Progress

A new study, led by PGRO, has observed the combined effects of perimeter trap crops and semiochemical attractants to manage pests in faba beans, in a bid to help growers reduce their reliance on insecticides. *CPM* delves into the detail.

By Charlotte Cunningham

Moving away from reliance on inputs is a topic hot in the headlines at present — not only encompassing fertiliser, but also crop protection chemistry — as the industry seeks to farm more with the environment in mind.

That said, taking a more holistic approach to crop production has been the direction of travel for quite some time for many growers, with integrated pest management (IPM) becoming an integral part of decision making on farm.

A new research project led by the Processors and Growers Research Organisation — funded by the Ekhaga Foundation — has sought to explore this further, in a bid to develop an IPM solution in faba beans which could help growers move from high insecticidal inputs towards cultural and organic production techniques.

While faba beans are an important part of UK rotations, they can be plagued by the presence of both the pea and bean weevil and the bruchid beetle.

Insect pests

In terms of how they impact a crop, infestations of weevils are attributed to yield reductions, while bruchid beetles cause damage to the grains in which the larvae feed upon, explains Dr Becky Howard, research and development manager at PGRO, who headed up the research project. “The challenge with both of these pests is that they’ve become more difficult for growers to manage,” she explains. “This is due to a combination of restrictions on chemistry usage and resistance issues within the insecticides that are available.

“Ultimately, we’re looking solely at pyrethroids for the control of both pests, and it’s fair to say that they’re not as effective as they could be.”

Becky adds that in organic production systems, the challenge is even greater, with very few effective management techniques at present.

This combination of factors framed the recent study which looked at alternative IPM practices to manage the pests — namely, trap cropping and using semiochemical attractants. “The purpose of the study was to see if it was possible to pull pests into the trap crop and to keep them there as long as possible — ultimately, to keep them away from the main crop. There’s also a lot of literature to suggest efficacy for trap crops — like lucerne — to host beneficial insects

too, so this is something we also wanted to explore.”

Becky says it was important to test both techniques under commercial-scale field conditions, and so three sites, operating different farming regimes and approaches to pest management, were selected.

For the purpose of the study, the farms were given reference names — PAP, MID and HH (see table ‘Farm details’). Two of the sites had trap crops containing lucerne or vetch, and the other had an early sown spring faba bean trap crop.

At site PAP, spring field beans were sown in April 2021 as the main crop and there was an area used as a control region which didn’t contain a trap crop. The trap crop was a long-term legume-rich margin that included vetch.

At site MID, lucerne was established in two of the trap crops in July 2020, and a third trap crop consisted of a grass and ▶



A new study carried out by PGRO has looked into IPM strategies to manage pests in faba beans.

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The purpose of the study was to see if it was possible to pull pests into the trap crop and to keep them there as long as possible, explains Becky Howard.

► flower mixture. Winter beans were sown in October 2020 as the main crop and there was no control area for comparison.

At site HH, there were two fields containing trap crops — one was used with additional pheromone and plant volatile insect lures, and one without. The trap crop in both fields was spring field beans sown in early January, and the main crop was spring field beans sown in April 2021.

No insecticides were applied to any of the field bean sites during the trial — though there was historic usage on some farms — and at each location 40 pheromone and 40 plant volatile bait stations were located within the trap crop, explains Becky.

Both types of lures used modified boll-weevil traps which allowed the pest to enter via the base and crawl into the trap. “In terms of positioning, they were arranged in two rows — one closer to the main crop and one further away,” she adds.

Observation-wise, assessments were carried out in a number of ways, across various growth stages.

With pea and bean weevil most likely



Infestations of pea and bean weevils are attributed to yield reductions.

to cause damage to the plant itself, pest damage and activity was assessed by looking for foliar damage, explains Becky. “Distinct adult weevil feeding notches were recorded on the top leaf pair on 25 plants at each sampling point in the main crop on at least two occasions following emergence of the crop.”

And with the bruchid beetle often causing damage to seed, this was the focus of these assessments, she adds. “Seeds were cut open and examined for the presence of larvae or adult beetles.”

Damage differences

“There are visible differences between damage caused by adult bruchid beetles and larvae,” points out Becky. “Adult beetle damage tends to be seen as a circular exit hole on the seed surface, whereas larvae tends to leave brown marks under the seed coat.”

The bait station traps were checked every two weeks and the number of beetles/weevils recorded, before being emptied ahead of the next observation date.

Other assessment methods included emergence traps to monitor weevil emergence from soil, as well as pitfall traps in both the main and trap crops. Observations on biodiversity at the sites were also made using sweep netting.

At BBCH growth stage 97, 10 plants were collected from each of the 20 assessment/sampling points within the main crop at each site to use as harvest samples. At site HH five additional samples were taken from each of the trap crops, explains Becky. “Pods were removed from the plants and seeds removed from pods. These were weighed, and moisture content was measured. Yield was calculated as t/ha for each sampling point, considering the plant density counts carried out at early crop growth stages.”

With so much data gathered during the observations, finding a way to express pest



Bruchid beetles cause damage to the grains in which the larvae feed upon.

damage and the impact on yield was a complex task, notes Becky.

Mean pest damage has been used to best represent this, and the study report detailed that there were some significant associations between yield and the mean number of weevil notches per plant at sites HH and MID (see ‘Pest damage summary’).

There was also a significant association between the mean percentage of bruchid damage and yield at MID that also affects yield, although this may not be a direct association but related to another factor — such as plant density or vigour, notes Becky. “There were no significant associations between pest damage and yield at PAP. Overall pest damage was lower at PAP than at MID or HH.

“In summary, from what we’ve seen so far we can say that the early sown spring faba bean trap crop appeared to have the clearest effect on pest levels in the main crop, and trap crops containing lucerne may have influenced the level of pea and bean weevil damage in winter sown beans at one of the sites.”

Rather interestingly, the sweep netting results showed that the PAP site also had a far greater percentage of beneficials (57%) — and subsequently, less pests —

Farm details

Site reference	Cultivation System	Whole farm spray regime	Crop	Trap crop details	Crop sown
PAP	Crops drilled directly into stubble	No insecticides	Spring Beans	Long term legume rich field margin	10 April 2021
MID	Plough-based	Insecticides only if required	Winter Beans	Mixture of lucerne and wild bird mixture	14 October 2020
HH	Plough-based	Standard insecticide programme	Spring Beans	Spring Beans sown in January	5 April 2021

Footnote: Farm details for the trap cropping sites in 2020-2021. Source: PGRO

Pest damage summary

Site	Mean % bruchid damage	Mean number of pea and bean weevil notches per plant
PAP	11.72	6.23
MID	13.47	20.47
HH9 (no lures)	21.66	8.94
HH10 (lures)	23.29	23.03

Footnote: Mean % damage to seed caused by bruchid beetles (by number of seeds) and mean number of pea and bean weevil notches per plant recorded at each site in 2021.

Source: PGRO

compared with the other trial sites. “This could possibly be due to the long-term regenerative approach taken on the farm,” concludes Becky.

The ‘PAP’ site is a 165ha farm in Cambridgeshire, farmed by Martin Lines, UK chair of the Nature Friendly Farming Network and CPM columnist. “Over the past few years, we’ve been focused on changing the system and transitioning towards a regen style system, which has much less reliance on inputs.”

In a bid to work with nature — rather than against it — Martin says he’s been able to remove insecticides from the system completely by recognising the benefit of creating good quality habitats for beneficial insects to promote the biological control of yield-robbing pests. “I quickly realised that the less we did — by means of insecticides — the more beneficials we had.”

When approached by the researchers, Martin says he thought this would be a good opportunity to put some science behind what he was seeing anecdotally. “The bruchid beetle has always been present here and we already had in situ a number of margins containing lucerne grown next to spring beans, so the site seemed a good fit.”

As highlighted in the study, Martin’s farm showed to have both the lowest level of pest damage and the highest level of beneficiaries. So what has this approach

meant practically on farm? “By not using insecticides we’ve increased our beneficials and experienced less pest damage. This has reduced our costs, while increasing our output, and I know I’m going to get paid in the future for delivering habitats for wildlife. It’s just an all-round better economic model for my farm.”

Habitat creation

Creating good quality habitats for beneficials is vital to make this work on farm, adds Martin. “They need habitat all year round, so it’s critical not to cut/remove everything and leave them with nothing over winter.

“I think it’s also important to have a diversity of plants in those areas, and for us, lucerne is working well.”

Martin says his next step is to try and gain a deeper understanding of what species are particularly useful for hosting beneficials.

He also adds that recognising beneficials will struggle to travel across big open fields, as found in the East, is important and so provision has to be made in terms of how fields and margins are structured in order to help them out.

“Nature has always delivered a balance in the past and given the current constraints on food production and climate change, I believe we need to find a new balance for the future.

“Our farm is a commercially run farm, and it has to make a profit, but nature gives us free gifts in predation and productivity. Essentially, the less cheques I have to write for products, the better I’m going to be as a business. It’s all about future-proofing what we’re doing.”

Though the first year of trials has provided some good direction for further research, Becky says it’s too soon to be thinking about any headline conclusions. “The preliminary results have provided us with a huge amount of data and getting to the bottom of that is complex. Therefore, at this point we’ve concluded that we need the full three years of data to make any strong conclusions regarding the efficacy of trap cropping and



Using beneficial insects is good for the environment and bottom line, believes Martin Lines.

semiochemical attractants.

“However, something that has been very clear is that where beans are sown early, there’s a big difference in pest damage levels – specifically, early sown beans have shown greater damage in the trap cropping area. What we’re now trying to determine is whether or not the main crop is experiencing more or less damage as a result.”

Following end of the 2021 trials, the study is being repeated this year and in 2023, with a greater number of trials set to be carried out at HH to further explore the potential of the early sown spring bean trap crop, explains Becky. “As well as this, a number of demonstration trial plots have been set up at the Cereals site in Cambridgeshire. The aim of this is to provide a site which facilitates discussion and knowledge exchange with other growers, and a comprehensive plot trial will be established later this year — and next year — with the results presented during the 2023 season.” ■



Adult beetle damage tends to be indicated by a circular exit hole on the seed surface.



Distinct feeding notches on leaves show the presence of adult weevils.