

WHAT DO BEEKEEPERS KNOW?

Hygienic Behaviour

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Honey bees are susceptible to many diseases. Most beekeepers try to control diseases in their colonies but it would be simpler if the bees did this themselves.

Although this may sound like a dream, honey bees do have many natural defences against diseases. One of these is hygienic behaviour. Hygienic worker bees remove dead and dying brood from capped cells. Previous research in the USA has shown that hygienic behaviour is effective against chalkbrood, American foul brood and varroa mites. Research at the Laboratory of Apiculture and Social Insects (LASI) has shown that, compared with non-hygienic colonies, hygienic colonies have only 43% of the annual build-up of varroa mites, have levels of deformed wing virus that are 10,000 times lower, and have significantly greater survival rates. LASI research has also shown that hygienic colonies do not mistakenly remove healthy brood.

Occurrence

Although hygienic behaviour is natural and widespread, it is not common. We do not know why it is rare. In one survey that LASI carried out of 31 beehives in Derbyshire, only one colony was fully hygienic; that is, the workers removed more than 95% of dead brood, killed by freezing with liquid nitrogen, from sealed cells within two days.

However, by rearing queens from hygienic colonies it is possible to breed for increased levels of hygienic behaviour. At LASI, we now have many colonies that are fully hygienic. We use these in our research and as breeder colonies from which to rear daughter queens. We are now making these available to UK beekeepers (see page 5).

Beekeeper Survey

At the moment, beekeepers in the UK and in other countries are not taking full advantage of hygienic behaviour. This is a pity given the problems being caused by pests and diseases, such as varroa, deformed wing virus and American foul brood, that can be controlled by hygienic behaviour. Is this because beekeepers are not aware of hygienic behaviour, or for some other reason?

We decided to survey beekeepers to find out if they had heard about hygienic behaviour and, if so, what their impressions were. We also wanted to find out how much experience they had in beekeeping activities necessary to take advantage of hygienic behaviour. For example, how many had the relatively advanced beekeeping skills necessary to rear queens and how many had the more basic skills needed to requeen a colony if hygienic queens were available?

Approach

To conduct our survey we used a questionnaire. Ideally, we would have given this to all British beekeepers or a true random sample of them. However, this was impossible. What we did was to give the questionnaire to beekeepers to whom we had access. These included beekeepers visiting LASI to attend training workshops, other beekeepers visiting LASI, beekeepers attending a talk given by someone from LASI at their local beekeeping association and beekeepers we contacted via social media. In total 136 beekeepers completed the questionnaire in 2014–15, 78 men (57.4%) and 58 women (42.6%). Collectively, they represented 1467 years of beekeeping experience and managed

a total of 3239 hives. One hundred and thirteen of the respondents were from the UK and 23 from Sweden. The Swedes were a visiting group belonging to the Swedish Professional Beekeepers' Association (Biodlingsföretagarna).

Although this was far from a random sample, it was a useful group to survey as it gave a picture of beekeepers who already had a link to LASI and so would be potential users of outreach information, such as information on breeding hygienic bees.

The questions included personal information about the beekeeper (age, gender, etc), his or her general beekeeping experience (number of years, number of colonies), his or her specific beekeeping experience (such as rearing queens), the extent to which he or she was involved in receiving training and his or her impressions of hygienic behaviour and the challenges facing beekeeping.

Results

Most of the UK beekeepers, 96.4%, had fewer than 25 hives, with half, 44.6%, having only 1–3 hives. Only a few, 3.6%, had 25 or more hives. The majority, 72.6%, were in the older 30-year age group, 50–79 years, versus 27.4% in the younger 30-year age group, 20–49 years. Like the UK beekeepers, the Swedish beekeepers were mainly in the 50–79 year age group, 95.5%, but most, 68.2%, had 25 or more hives.

All of the training methods we enquired about had been used by a large proportion of the respondents. Reading books was the most common, 89.7%, but attending courses was also common; 68.4% had attended multi-day courses and 35.3% had participated in day courses. It is interesting to see that nearly half, 46.3%, had taken

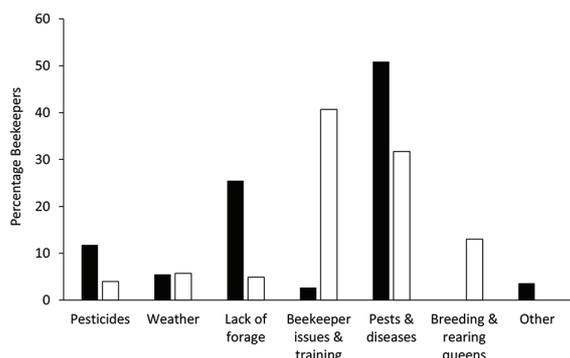


Figure 1: What do you feel is the most important challenge facing honey bees in Britain (black bars)? What do you feel is the most important challenge facing you in your own beekeeping operation (white bars)?

examinations and that mentoring was common, 56.6%. Quite a number of beekeepers, 9.6%, had received all five types of training.

The beekeepers surveyed covered the full range from novice, 22.1%, to very experienced, 11.8%. The biggest group, 47.1%, considered themselves to be moderately experienced.

Most respondents, 80.7%, considered themselves to be small-scale beekeepers. This was especially true for the UK beekeepers, only 4.4% and 2.7% of whom considered themselves to be part-time or full-time commercial. The situation was reversed for the Swedish beekeepers, with 43.5% and 39.1% being part-time or full-time commercial.

There was a wide range of apiary locations. A large proportion of beekeepers, 66.7%, kept hives at their home. Non-home apiaries were 0.1–40 miles away, with most, 70.5%, of the 78 non-home apiaries less than five miles distant. Four beekeepers, 3.0%, had roof-top hives and seven, 5.2%, kept hives at an apiary belonging to a beekeeping association. Having rural apiaries was most common, 50.8%, with urban, 24.2%, and both rural and urban, 25.8%, almost equally common.

Eighty-seven per cent of respondents monitored their colonies, kept written records, and selected colonies which needed the queen replacing. Eighty-four per cent of respondents thought their own beekeeping could benefit from a selection programme aimed at improving the characteristics of their bees.

In terms of queen rearing, approximately one-third, 28.1%, had grafted larvae and 9.6% had used the Jenter method of starting queen larvae. Most had some useful basic beekeeping skills relevant to using hygienic queens, including splitting a colony,

62.2%, and removing a queen, 38.5%. Twenty-three per cent had never reared a queen or increased numbers of colonies by active manipulation.

The majority of respondents, 81.2%, had heard about hygienic behaviour. Most, 79.0%, thought it was a useful trait, some, 12.9%, were not sure and none answered that it was not a useful trait.

Most, 72.8%, would buy hygienic queens if they were available for sale. Twenty-five of the beekeepers, 18.9%, had tested hives for hygienic behaviour using a variety of methods with pin-killing of brood being the most common.

Of those beekeepers expressing an opinion on the bee characteristics they would like to improve, disease and varroa resistance was the most important of the six options suggested (gentleness, high honey production, non/low swarming, disease/varroa resistance, overwintering, other) with gentleness second. In agreement with this, pests and diseases were considered the most important challenges facing honey bees in Britain today, 50.9%, with lack of forage coming second, 25.5% (Figure 1). However, in their own beekeeping, the most important challenges were beekeeping issues and training, 40.7%, with pests and diseases coming second, 31.7%.

What Have We Learned?

The results of the questionnaire show that the beekeepers surveyed take learning about beekeeping seriously. A large proportion has been involved with the different training methods, and beekeeping issues and training are considered the most important challenges in the beekeeper's own operation.

Almost all of the beekeepers had heard

about hygienic behaviour and considered it of value and would buy hygienic queens if available. They also considered resistance to pests and diseases the most important trait in honey bees that needed improvement, and that pests and diseases are the most important challenges facing honey bees in Britain. In their own beekeeping they considered pests and diseases the second most important challenge, after beekeeping issues and training.

Most beekeepers do not have experience of queen rearing (eg, grafting of larvae), but most have basic skills that would allow them to use hygienic queens if available (dequeening a colony, splitting a colony).

In terms of breeding hygienic bees, only a small proportion of the UK beekeepers, 3.6%, but a majority of the Swedish beekeepers, 68.2%, had 25 hives or more. This is probably the minimum number needed to have a reasonable chance of identifying one or a few hygienic colonies that could be used in a breeding programme.

Most of the UK beekeepers we surveyed were small-scale beekeepers with 1–3 hives, far fewer than are needed to use for an initial screening of colonies to identify hygienic breeder stock. However, small-scale beekeepers could still receive hygienic queens or work with other small-scale beekeepers or a local beekeeping association to screen larger numbers of colonies to find hygienic colonies.

By contrast, most of the Swedish beekeepers surveyed had enough colonies to screen their own colonies for hygienic behaviour usefully. This does not necessarily reflect a difference between the UK and Sweden, as the Swedish beekeepers belonged to an association of commercial beekeepers. In this respect they were probably more similar to the Bee Farmers' Association in the UK.

Overall, the beekeepers we surveyed were keen to learn more about beekeeping and had a very positive attitude towards hygienic behaviour. They considered pests and diseases a major challenge to bees and beekeeping. Almost all of them had the beekeeping skills needed to use hygienic queens, but most of the UK beekeepers did not have the number of colonies needed to carry out their own breeding programme for producing hygienic bees. ☘