Your Letters

Varroa Treatment and Colony Losses

In the August issue of *BBKA News*, David Heaf, Clive and Shân Hudson reported honey bee colony losses over the past five winters in Gwynedd, Wales. Their figures suggest that, instead of helping the bees survive the depredations of varroa, chemical treatment was not beneficial and may even have enhanced colony demise. In fact, average yearly losses were 19% among treated colonies, and only 13% in colonies left to their own devices. In every year from 2010–11 to 2013–14, winter losses were greater among treated than untreated colonies and in 2015 no difference was detected. I calculate there were 72 losses overall in the treated colonies, when 55 would be expected if treatment had no effect. The overall sample was large (1,096 untreated colonies and 477 treated), but the authors exercised caution and suggested the observed differences were probably statistically non-significant. However, I have analysed the data statistically and conclude that these differences are actually significant. In other words, taken as they are, they suggest that chemical treatment against varroa is indeed associated with significantly higher winter losses than occur when no treatment is applied.

For data of this type the standard statistical test is the χ^2, or chi-squared (pronounced 'ky-squared') test, in which you compare observed values with those expected if the treatment had had no effect. The data as reported produce a χ^2 value of around 12.7, which corresponds to a *p* value (for 'four degrees of freedom') of between 0.01 and 0.02. What this means is that the observed discrepancy from expected numbers would occur by random chance in only 1–2% of trials, so would be very unlikely indeed to have arisen as just a fluke. A p value between 0.02 and 0.05 is obtained if the basic data is conventionally adjusted for the low expected values in 2010–11 and 2013–14. If the unadjusted figures for all five years are combined, χ^2 is around 5.25, corresponding to a p value (for 'one degree of freedom') close to 0.02. If my analyses are correct, overall this outcome would be considered by statisticians to indicate a 'significant' result. That means there seem to be real differences between the survival prospects of treated and untreated colonies, which could indicate detrimental effects of treatment.

However, statistical analysis is notoriously fraught with pitfalls and it is always wise to ask oneself 'is there a hidden assumption?' To be valid, the populations under comparison must be no different from one another except in the parameter under investigation. In this case it is a fair bet that virtually every treated hive initially contained varroa mites, or the beekeepers would not have used the treatment. But despite a widespread belief to the contrary, that cannot reliably be said of untreated hives. The necessary condition that all had similar levels of infestation is almost certainly untrue, which renders a straightforward comparison suspect. Indeed, if the treaters were doing so because they saw lots of mites, the seemingly higher loss rate could be due to those mites rather than the treatment.

Another possible explanation for the figures is that acaricides may have hindered the natural responses of bees to mites in their hives. *Apis cerana* workers get rid of mites from their bodies by grooming themselves, or one another, with their forelegs and mandibles, resulting in visibly damaged mites falling to the floor. Several races of *Apis mellifera* behave in a similar manner and this is especially so with British near-native *A.m.mellifera*, some of which succeed in keeping their colonies virtually mite free. Auto-grooming of *Apis mellifera* can be artificially stimulated by dusting with icing sugar and it has been shown that the fall of damaged mites initiated by sugar dusting is reduced in colonies that had previously been treated with Amitraz (Stevanovic *et al*, 2012). Amitraz is chemically unrelated to the better known acaricides and not licensed for use in the UK. Modification of bee behaviour could, however, be another reason why in the reported situation treated colonies suffered higher losses.

While we cannot be sure from just these figures, why the acaricide treated colonies had the greater proportion of losses, this remains an interesting observation that merits further study.

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Acknowledgement

I wish to thank David Heaf for a stimulating exchange of ideas.

References

Bishop ON. 1980. *Statistics for Biology. A practical guide for the experimental biologist.* 3rd Edn. Longman.

Stevanovic J, Stanimirovic Z, Lakic N, Djelic N, Radovic I. Stimulating effect of sugar dusting on honey bee grooming behaviour. *Entomologia Experimentalis et Applicata* 2012; 143: 23–30; doi: 10.1111/j.1570-7458

Dates for your Diary

2016

12 January. West Dorset BKA and East Devon BKA joint meeting. John Haverson, Warre Hives at Whitchurch Canonicorum Village Hall, Nr Bridport DT6 6RF. Details: Carole Brown 01308 456210.

16 January. Bee Improvement for All Day. Improve your bees using simple methods. Welwyn, Herts. BIBBA/Hertfordshire BKA. Details: Mike Goodhew. training@hertsbees.org.uk.

30 January. Bee Improvement for All Day. Improve your bees using simple methods. Ferndown, Dorset. BIBBA/Bournemouth and Dorset South BKA. Details: Alla Neal. lapa11@hotmail.com

6 February. Bee Improvement for All Day. Crewe. BIBBA/North Staffordshire BKA. Details: Angela Fearon. 07764 605 663. angelafearon@googlemail.com.

20 February. Somerset BKA Lecture Day. Speakers: Dr Jamie Ellis, Dr Stephen Martin and John Whitaker. Details and tickets: Steve Horne 01278 662335 or steve.horne1@btinternet.com.

21 February. Bee Improvement for All Day. Improve your bees using simple methods. Lampeter. BIBBA/Lampeter BKA. Details: Sandra Lane. sandra@lanesframes.co.uk.

28 February. Bee Improvement for All Day. Improve your bees using simple methods. BIBBA/Southampton and District BKA. Details: Dave Norris. bifa@southamptonbeekeepers.co.uk.