



Animal &
Plant Health
Agency

National Bee Unit

'Beltsville' and Pyrethroid Resistance Testing

Pyrethroids are chemicals that have a low toxicity to mammals and birds but a high toxicity to insects. They require very low doses to kill their target species and are very fast acting. They work by inhibiting the nervous system of the target which can result in paralysis. The effectiveness of pyrethroids on *Varroa destructor* has declined in the past decade due to the mite having developed resistance to the chemical. This Fact Sheet discusses how to determine whether the mites in your colonies are resistant to pyrethroids and what you can do should you discover you have them.

What treatments should I be monitoring?

Any pyrethroid based varroacide such as 'flumethrin', 'tau-fluvalinate' and Amitraz which are the active ingredients of the proprietary varroacides 'Bayvarol®', 'Apistan®' and Apitraz.

You can ascertain if you have pyrethroid resistant mites by carrying out the Beltsville test:

1. Cut a 9mm x 25mm piece from an Apistan® or Bayvarol® strip and staple it to the centre of a piece of thin card about 75mm x 125mm in size.
2. Place the card in a 500ml jar, or 1lb. honey jar, with the strip facing inwards.
3. Prepare a 2-3mm mesh cover to close the jar. Plastic greenhouse shading mesh is ideal. Cut a piece larger than the opening so that it can be folded back over the open end of the jar and secured using a strong elastic band.

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4. **Take precautions not to sample the queen.** Shake adult bees from 1 or 2 brood combs into a container such as an upturned roof or washing up bowl. Gently scoop up bees with the jar until it is half full.
5. Place a sugar cube in the jar and seal off using the mesh. Store the jar in the dark at room temperature with the mesh uppermost.
6. After 24 hours hit the upturned jar with the palm of your hand over white paper. Repeat two more times to dislodge any mites. Count the mites knocked out.
7. Immerse the bees in the jar into a solution of water and washing up liquid (strong washing up strength).
8. Wash the dead bees to remove any remaining mites. Place the bees in a coarse kitchen sieve which will hold bees but let *Varroa* mites through. Secure a honey straining cloth or jelly bag under the sieve to retain mites. Place under a fast running tap or tap with a shower fitting to wash any remaining mites off the bees. Count the number of mites washed off. Dispose of the dead bees and mites in a suitable way, such as composting.
9. If the total number of mites is less than 5 discard the results.
10. Calculate the efficacy as a percentage. Multiply the number of mites knocked down by 100 and divide by the total number of mites i.e. the number knocked down plus those washed off. If the answer is less than 50% it indicates that a resistance problem is likely.

Avoiding resistance to further treatments

Where possible alternate the use of varroacide treatments between registered varroacides Apiguard®, ApiLife-VAR®, Bayvarol® and Apistan®, Mite Away Quick Strips and Thymovar. The active ingredients in Bayvarol® and Apistan® are very similar so alternating these two preparations makes no difference to the selection pressure.

Consider other systems of *Varroa* control and develop an integrated management system to control mites. These can range from using open mesh floors to bio-technical control methods, some of which can remove up to 95% of mites within a colony. Further details can be found in the NBU leaflet '*Managing Varroa*'.

Whatever control method you use, check the colony mite population afterwards to ensure that it is not at risk.

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