NSW GOVERNMENT Primary Industries

FACTSHEET

Pollen trapping and storage

Doug Somerville, Technical Specialist Honey Bees, Goulburn

Pollen

Pollen is the male reproductive element of flowering plants. While it provides genetic material and nutrients for the development of seed, it is also an important component of honey bee nutrition. Pollen is gathered by foraging field bees from the male parts of flowering plants called the anthers. When foraging on flowering plants bees become covered with pollen grains. This aids the transfer of pollen between flowers (cross-pollination).

Although this is important for many plants to prosper, it is also an important ingredient in satisfying honey bee nutritional requirements.

Nectar is collected by field bees, which is converted into honey in the hive. This satisfies the carbohydrate requirements of the colony. Basically, pollen satisfies all the other dietary requirements for developing larvae and young adult bees including protein (amino acids), fats/lipids, vitamins, minerals and sterols.

Brood rearing activity in the colony influences the quantity of pollen collected by bees. The larger the brood area to be fed the greater the demand for pollen. Queenless colonies continue to collect pollen, which is stored in the brood combs despite having no brood to nurture.

Colonies deprived of sufficient pollen - either in quality or quantity - will use their own body protein to feed larvae. Brood reared on poor quality pollen produces adult bees with reduced longevity and colonies deprived of pollen will eventually cease rearing brood.

Nutritional value of pollen

Pollens from different floral species can vary significantly in relation to protein (amino acids), lipids/ fats, mineral and vitamin content. For this reason, some pollen sources are considered of higher value than others in their contribution to honey bee nutrition.

As an example, pollen produced by pine trees is considered to be of low value in pollen quality with a protein level of around 7%. Paterson's curse and Banksias at 34% are excellent. Pollens need to have a protein level of 20% to satisfy minimum honey bee dietary requirements. In addition, all other dietary requirements for amino acids, fat/lipids and minerals must be at desirable levels. What these desirable dietary levels are, is not yet fully understood.

Honey bees often overcome any dietary deficiency in one pollen source by having access to multiple floral sources. Pollens collected concurrently from three or more floral sources will often balance out any deficiency experienced from one single source.

A strong productive colony may consume over 50kg of pollen per year when it is being manipulated and worked in an intensive manner.

Figure 1. Pollen pellets in collection tray

Seasonal issues

The climate largely dictates the flowering frequency and extent of our diversified floral species.

A bee colony will expand its brood area in early spring as the weather warms and the number of flowering plants yielding nectar and pollen increases.

With an ever-increasing area of brood comes the increasing demand for nectar and particularly for pollen.

This demand may extend for 12 months of the year if large quantities of bees are required for honey flows or pollination work.

Normally in spring there is an abundance of available pollen. Pollen may be abundant at some other times of the year, depending on the characteristics of the flora in various regions.

Pollen trapping should only be considered when the colony is strong in population and there is more than enough pollen available to meet the colony's immediate needs.

Pollen trapping

Worker bees collect pollen from flowers and carry it back to the hive packed in pellets on the pollen baskets on the rear legs. By encouraging returning field bees to enter the hive through small holes in a wire mesh or a punched plate, the pellets of pollen can be scraped from the legs and collected in a suitable tray.

Pollen traps

A variety of designs of pollen traps have been developed from the basic concept of scraping pollen off the bees' legs as they enter the hive. All have some type of collecting tray located under the trapping screen which is covered with mesh to prevent retrieval of pollen by the bees.

A good pollen trap should satisfy the following basic conditions:

- Efficient trapping mechanism - 60–80% of all pollen bought into the hive.
- Ease of operation and pollen collection.
- Protection of pollen from sunlight, moisture and adulteration.
- Uniformity with other hive components.
- Pollen traps can either replace the bottom board
- or be front-mounted.

Figure 2. Bottom pollen trap design

Figure 3. Hive with pollen trap

Bottom traps have the following basic components:

- Trap is housed in a standard langstroth hive body. The depth of the hive body is determined by the design of the trap. The body is fitted with cleats, entrance is determined by design, and it has a screen bottom 3mm wire mesh openings.
- A collection drawer is housed in the hive body, sliding out to the rear of the hive. For ease of operation, this drawer can be made with sloping sides, and may be protected by a sliding outer cover. The pollen collecting area of the drawer is fitted with a plastic flywire or stainless steel mesh bottom to allow good ventilation of the collected pollen.

Figure 4. Bottom pollen trap with collection tray and baffle board removed

- A protective screen of 3mm mesh screen opening, is fitted above the collection drawer to prevent bees retrieving trapped pollen. The entrance is located immediately after this screen.
- A trapping screen is located so the bees are forced to enter the hive through it. This screen may be 5mm wire mesh screen or punched metal plate (5 mesh).
- Provision for drones to escape from above the trapping screen will prevent an accumulation of dead drones in the pollen trap. Drone escapes are constructed from 8mm internal diameter plastic tube from the inside of the trap end protruding outside the hive body.
- A waste reduction design should also be considered where house bees do not have to drag waste material from the hive back through the trapping mechanism, potentially contaminating the pollen collected.

Front mounted traps have some similar components including collection draw, protective screen above the draw and a trapping screen located above the collection draw.

Front mounted traps are fastened to the front of a hive and cover the existing entrance. They have the advantage of being easily removed, although their storage capacity is a lot less than bottom mounted traps. Less material is used to make a front mounted trap. A very neat and snug fit is required for a front trap to work well, as returning field bees will avoid the trapping mechanism if this is an option.

Figure 5. Hive with front fitting pollen trap

Figure 6. Hive with front fitting pollen trap, collection draw removed

Collecting pollen

For human consumption, pollen should be collected from traps every 2-3 days. If pollen is being collected for feedback to bees, then every 5-7 days is satisfactory - although this may be more frequent in humid or damp weather.

If pollen is intended for human consumption, sanitary handling is essential at all stages.

If ants become a problem by robbing pollen, or the bee colony declines in strength, pollen collection should cease. Ants can be a major problem and control of the ant population may be required.

Collected pollen should be temporarily stored in a ventilated container, holding 5-7kg, and transported to suitable premises for processing.

Processing

Unlike honey, pollen is subject to spoilage from moulds, fungi and bacteria. Quality control is of utmost importance, particularly if the pollen is intended for human consumption. To prevent deterioration pollen should be processed soon after collection.

Pollen can be stored either in a frozen state or dried. For the human consumption market it is best to dry the pollen. There are three stages in processing pollen for human consumption:

- Drying.
- Cleaning.
- Storage.

Drying

Pollen varies in moisture content from between 7 and 21% when collected. It needs to be dried to prevent mould growth and deterioration. A simple and effective drying process is necessary.

A desirable moisture content for storage is between 2.5 and 6%. Moisture can be determined by laboratory testing until sufficient expertise at judging moisture is developed. Occasional laboratory tests should be carried out to ensure accurate estimates are maintained.

Air drying can be used to reduce the moisture content of pollen but will not normally get the pollen dry enough for marketing. For air drying, the pollen is spread about 20mm deep in shallow trays with flywire bottoms. It should not be placed in direct sunlight, and may have to be protected from bees.

Air drying systems can be developed at low expense and are effective for batch lots of pollen. Warm, dry air is forced through the pollen, removing the moisture. The recommended drying temperature is 45°C, but merely heating the air is not sufficient in times of high humidity. It may be necessary to dry the air before it is heated and forced through the pollen.

Estimating Dryness

Experience will be necessary before accurate estimates of moisture content will be possible. The following guides may be useful.

Attempt to break a pollen pellet between the finger nails:

- If it does not disintegrate and is difficult to break - moisture is 2.5-5%;
- if it breaks with pressure but does not powder - moisture is above 5%.

These tests are rough guides only. Laboratory checks are necessary on a regular basis.

Cleaning

Removal of foreign material from pollen pellets is carried out after the pollen is dried to about 6% moisture. Cleaning of pollen will be simplified if the amount of waste is reduced in the trapping process.

Traps vary in the degree with which hive waste is avoided in the collection trays.

Basic cleaning of small pollen collections can be carried out with a series of hand sieves. First the dust is removed with a sieve of fine fibre glass mesh. The pollen is then passed through two closely held 3mm mesh screens to remove the larger debris. Some hand picking is necessary to remove the remaining debris.

A simple alternative is a gravity fed screening system. The pollen is poured over a slanted punched or slotted screen, capable of withholding large debris. The pollen passes through successive screens with a collection box at the bottom of each plate. Below the lowest plate is a box for the collection of dust.

Storage

Immediately after drying and cleaning, pollen should be packaged in clean, airtight containers. If allowed to stand in the open air for any period of time, the pollen will absorb moisture from the air and subsequently deteriorate.

No fumigants are recommended, as pollen which has not been treated with chemicals has a higher market acceptance. To protect pollen from insect infestations, sealed containers of pollen should be frozen for 24 to 48 hours, then stored under normal refrigeration.

Pollen should be used or sold as soon as possible after collection, ensuring freshness. Pollen for bee

feeding should be used within 9-12 months of collection.

If pollen is to be trapped and stored for feedback to bees, then drying the collected pollen is not required if it can be frozen. The process of drying pollen will reduce the nutritive value of pollen and thus, the value as a future bee feed. Ideally, pollen should be collected and frozen in sealed containers to retain the maximum levels of nutrient value necessary to meet honey bee dietary requirements.

Keeping pollen frozen is difficult, thus the tendency to dry pollen for sale to the health food market or to other beekeepers for bee food. Pollen in a frozen state will lose some of its nutritional value slower than dried pollen.

Market standards

For human consumption flavour and appearance of pollen appear to be the main characteristics.

Lighter coloured pollens - particularly cream and bright yellow - are favoured. An even colour is preferred.

Some pollens may have a bitter flavour and are undesirable. For some markets, flavour alone could be the criteria for sale.

For bee feed a mixed pollen will provide a more balanced diet. Freedom from contamination and freshness would be the major criteria for bee feed pollen. Protein levels are also important guides to the value of pollen for bee feed.

Freedom from pesticides is a major consideration for any market. Pesticide contamination could occur if pollen was collected from crops to which pesticides were applied. For this reason, pollen collection on agricultural crops should be avoided.

Bee feed

Many replacement supplements for pollen have been researched world wide for many years, yet no satisfactory substitute has been produced. Fresh pollen remains the ideal source for a range of honey bee dietary requirements. Collection of pollen - either trapping the pellets or removing frames of stored pollen during periods of pollen surplus – has been in practise by some beekeepers for many years.

It is fed back to bees when required in the medium term to maintain colony populations to work pollen deficient honey flows.

It is strongly recommended that pollen should be gamma irradiated before being fed to bees to ensure it's not carrying any bee disease pathogens.

Bee management

It is important that any colony used for pollen trapping requires special management to ensure sufficient pollen is made available to satisfy its own brood rearing requirements.

This can be achieved by:

- using active colonies with young queens,
- activating traps only during periods of pollen abundance,
- allowing the colony periods of flight, free from trapping, whenever pollen intake slows,
- practising brood manipulation to maximise the colony's population,
- transferring traps to other hives if continuous production is required.

If continuous trapping is required, then modification of traps by slightly enlarging 2-3 holes in the punch plate allows a proportion of bees to pass through, into the hive proper, without their pollen loads becoming detached. This ensures an adequate supply of pollen for the colony's use during the trapping period. The enlarged holes have the added benefit of allowing virgin queens (the result of supersedure) to leave the hive for mating. This practice substantially reduces the number of queenless colonies, which may occur when hives are trapping pollen over an extended period.

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