Eva Crane Trust

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TITLE: What makes a good honey plant?

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Bee Products

What makes a good honey plant?

The largest honey yields are not necessarily from flowers that appear to produce most nectar, nor from those that bees seem to visit most. The key factors are the total amount of nectar-sugar secreted per flower and the total numbers of flowers during the flowering period that are within flight range of the honey-producing colony. If the bees are to exploit the nectar flow to the full, the weather must be such that bees can fly, and there must not be so many of them that colony competes with colony; each colony must be populous, with a proportionately large force of foragers. There are some secondary considerations; for instance the flowers that produce the nectar must not be objectionable to the bees for any reason, nor must the honey produced be obnoxious to the human consumer.

In terms of honeydew, which can yield very large honey crops in coniferous forests, the key factors are the amount of honeydew sugar available daily within flight range, and the length of time the flow continues. These factors depend on the success of the seasonal population expansions of the honeydew-producing lachnids.

Sugar secretion by flowers

This is usually assessed by the "sugar value", the weight of sugar produced by one flower in 24 hours. Nectar is withdrawn periodically with a micropipette, and the sugar value calculated from its volume and sugar concentration. (The actual removal of nectar, whether by bees or by a pipette, can stimulate further secretion, but that does not affect the main argument.) In the list below, S is the number of milligrams of sugar secreted in 24 hours by a single flower of the plant; C is the concentration of sugar in the nectar, which is also important: bees are more attracted to nectar rich in sugar, and they will expend comparatively little energy in reducing the water content of the nectar to the 18% or so that ripe honey contains. All the plants listed are good honey sources except the first.

Plant	*Family*	*Sugar concentration (C)*	*Amount of sugar (S)*
1. *Prunus domestica* (plum)	Rosaceae	15%	0·1 –1·5
2. *Vicia faba* (bean)	Leguminosae	22%	4·2
3. *Tilia platyphyllos* (large-leaved lime)	Tiliaceae	32%	up to 7·7
4. *Tilia cordata* (small-leaved lime)	Tiliaceae	35%	0·6 –3·6
5. *Helianthus annuus* (sunflower)	Compositae	37%	0·1 –0·3
6. *Trifolium repens* (white clover)	Leguminosae	40%	0·01–0·14
7. *Rubus idaeus* (raspberry)	Rosaceae	46%	up to 8
8. *Borago officinalis* (borage)	Boraginaceae	53%	up to 4·9
9. *Robinia pseudoacacia* (black locust)	Leguminosae	55%	1·0
10. *Origanum vulgare* (marjoram)	Labiatae	76%	0·04

A tiny floret in a flower head (5, 6, 10) yields less sugar than a large flower (3, 4, 7), but if the plant produces large numbers of these florets, the total sugar yield may be high. Flowers that give a good sugar yield tend to belong to certain plant families, six of which are represented above; some are in bloom for a number of days, giving a total sugar yield 5 or even 10 times the value of S quoted on the previous page.

Flowering density and duration

Most bees forage within say a kilometre or half a mile of their hive, although they may fly several miles if the survival of their colony depends on it. A colony's main foraging area is likely to cover say half a hectare (1 square mile), and its nectar and pollen income depends entirely on the plants growing there. Somewhere between 10 000 and a million flowers within that area will be needed to produce a jar of honey. A good honey plant may flower at high density over a broad area (a field of rape is an example), and trees may increase the flowering density by adding an extra dimension upwards—eucalypts, robinia, orange, lime, for instance. Alternatively—or better still, in addition—the plants may produce a succession of flowers over a long period; examples in the north temperate zone are blackberry, fireweed (rosebay willowherb), and white clover.

At high latitudes the days are long during the short growing season, and in general nectar secretion is more intense. So, for instance, in Sweden the honey yields increase from south to north. In the tropics, on the other hand, one plant species may produce a succession of flowers for months on end, and give a honey flow of sorts for half the year or more. An example in tropical America is tah (*Viguiera helianthoides*).

If hives are taken to a site temporarily to work a crop, then it is important that the density of flowering is high, as for instance in legume seed plots, rape, citrus or heather. If the plant in question is only one of a mixed flora surrounding an apiary, a growth habit leading to a high density of flowering is not so important, since the plant may be interspersed with others that yield honey.

Other factors

There are various negative factors, which would exclude even a prolific sugar-producer from the category of good honey plants. It might be that the nectar is too deep in the corolla for the bees to reach (first-cut red clover), or that it "trips" or explodes when the bees work it (lucerne), or that it is slippery and thus does not give a good footing (female coconut flower), or the nectar may be unpalatable to bees (some onion nectars with a high potassium content). A few honeys are obnoxious to humans and few others are poisonous.

The bees' "best buy"

The "honey potential" of a plant is a term used for the amount of honey that could be produced per unit area of land; the figure is almost the same whether measured in kg/ha or lb/acre. It is effectively the sugar value, flower density, and duration of flowering, multiplied together. Estimations are usually made from measurements of the above three factors, but it is sometimes possible to check them by weight gains of hives on the crop concerned. The honey potential could be realized only if all available nectar is collected by bees. Most of the estimations of honey potential have been made in eastern European countries where there is great concern with economic utilization of natural resources. Plants that score high tend to be grouped in certain

families, the same that are represented by plants 2–9 in the list on page 32. Out of 200 plants whose honey potential is rated in a forthcoming book*, the best are four labiates and three legumes, all theoretically capable of yielding over 500 lb/acre or kg/ha of honey under ideal conditions: *Lamium album, Salvia officinalis, S. verticillata, Thymus vulgaris* (white deadnettle, garden sage, whorl-flowered clary common thyme); *Caragana arborescens, Melilotus alba, Robinia pseudoacacia* (Siberian pea tree, white melilot or sweet clover, and black locust). Members of the Boraginaceae, Compositae and Tiliaceae are next in importance. Not all these plants grow compactly in dense stands, but most of them do so somewhere: thyme in Greece, *Caragana* in USSR, melilot in Canada, *Robinia* in Hungary and Rumania.

We lack comparative assessments of non-European honey plants: the tulip tree (*Liriodendron tulipifera*) in USA, which is reputed to yield a teaspoonful of nectar per flower, and a pound of honey per tree; aloes in South Africa; and—above all—eucalypts in Australia and the many countries to which they have been imported.

EVA CRANE

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* "Honey: a comprehensive survey" published by William Heinemann Ltd. in collaboration with Bee Research Association.