Notes

Honey Bee, *Apis mellifera*, Pollen Foraging in Southern Ontario

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Honey Bee, *Apis mellifera*, pollen pellets were collected for five days each week for 16 weeks at the University of Guelph. They were sorted by color, the dispersed pollen cleaned by acetolysis and identified under a light microscope. Over 99% of pollen in each pellet was of one pollen type. Twenty-five pollen types were identified. Over 75% of the pellets were pollen from introduced taxa. The pattern of pollen collection by the bees reflected the blooming period of the plants.

Key Words: Honey Bee, *Apis mellifera*, pollen, foraging pattern, Ontario.

Pollen is a necessary dietary source of protein, vitamins, fats and minerals for Honey Bees, *Apis mellifera*. Pollen is collected by foraging worker bees and carried to the hive in pellets packed on their hind legs (Stanley and Linskens 1974). These pellets are stored within the bee hive and eventually consumed by "nurse bees", who metabolize the pollen to produce the protein-rich food "royal jelly" for the bee brood (Hodges 1984). In southern Ontario, during the April-October pollen and nectar foraging season bees visit plant species as they come into bloom, pollinating both domestic and wild plant species, although plant species that provide bees with pollen are not necessarily the same as those that provide nectar. Pollen types in pellets reflect both the sequence of blooming during a foraging season and the local foraging pattern of a bee colony. Pellet colors vary with source species; knowledge of preferred species may assist in choosing optimal sites for apiaries (Kirk 1994) for healthy growth and pollination.

The only published pellet study in southern Ontario is for hives located near Brantford, Ontario. Adams et al. (1978) recorded a 24-week foraging season spanning 18 April - 1 October 1976. Weekly collections of pellets were not sorted by color but mixed together before the pollen was cleaned by acetolysis and the pollen types identified. There were 14 common pollen types (see Table 1 for most equivalent latin names): cf. dandelion, cf. Apple, sumach (*Rhus*), Loosestrife, jewel-weed, maple (*Acer*), willow, Lilac (*Syringia vulgaris*), oak (*Quercus*), buckthorn, White Clover (*Trifolium repens*), Red Clover (*T. pratense*), sweet clover and goldenrod. In addition, there were 32 rare types including Blue-weed, pink family, thistle, grass family (Gramineae, Poaceae), Horse Chestnut, honeysuckle, crowfoot family, mustard family, Alfalfa-Black Medick, elderberry and burdock.

Our study parallels the report of Adams et al. (1978), but for a shorter period of 15 weeks, 9 May - 10 September 1990, and at a site located 45 km to the north at the University of Guelph (latitude 43° 31.4' N, longitude 80° 12.6' W). We collected pellets from eight hives for five days each week using horizontal grid pollen traps (Scott-Dupree 1987). Instead of mixing weekly pellet collections, we sorted pellets by color. For each pellet color, a pellet was dispersed and the pollen cleaned of surficial oil and internal cytoplasm by acetolysis (Faegri and Iversen 1989); this permitted an unobstructed view of the taxonomic characters of the pollen wall. Pollen identifications followed keys to European pollen types in Faegri and Iversen (1989) and McAndrews et al. (1973) but were checked against pollen from identified species.

During the 1990 season, 13 565 pollen pellets weighing 138 g were sorted and counted (Table 1). Weekly collections ranged from 505 to 122 pellets; three pellets contained fungal spores not pollen. Seven pellet colors were identified, ranging from white to purple, but most pellets were a shade of yellow. Eighteen pollen types were identified where the pollen pellet color and shade was distinctive. The remaining seven types were less color-distinctive, with several colors and shades representing a single plant taxon (cf. Kirk 1994).

Over 99% of pollen grains in any one pellet were from a single plant species, demonstrating the high

TABLE 1. Honey Bee, *Apis mellifera*, pollen pellets collected from hives at the University of Guelph during 1990. An asterisk indicates an introduced plant. Collection weeks are numbered from 1 beginning 9 May; bold face indicates most abundant pellet type for week. Some pellets from week 1 (9 May) collection were sweet clover although the season was too early for it to flower; among all the samples only this one appears mislabelled. Nomenclature follows Gleason and Cronquist (1991).

Common Name	Latin Name	Pellet Color	Collection week	Pellets	Pellets (g)	Comments
*Apple	*Pyrus malus*	yellow/green	**1 2 4** 7	1322	26.17	Local ornamental and crop tree.
*Black Medick	*Medicago lupulina*	green/grey	8 **9** 10 12 13 15	1446	17.74	Local weedy herb.
*sweet clover	*Melilotus*	yellow	1 **7** 9 **13**	1919	15.55	Local weedy herb.
*buckthorn	*Rhamnus*	yellow/green	**3**	507	12.83	*R. frangula* naturalized shrub locally common on wet soil.
*spurge	*Euphorbia*	yellow/green	**7 8** 9 10	1620	12.43	*E. corrolata* reported to be local.
rose family	Rosaceae	orange/brown	**11**	844	9.71	Trees, shrubs and herbs.
Nannyberry	*Viburnum lentago*	orange/brown	**5 6**	1361	8.86	Shrub of forest edges and openings not recorded and local.
aster-goldenrod	*Aster-Solidago*	yellow/orange	**14** 15	719	7.76	Local weedy herbs.
*bellflower	*Campanula*	dark yellow	**12**	459	5.74	*C. rapunculoides* weedy ornamental herb not recorded as local.
*mustard family	Brassicaceae	yellow/green	2 6 8 9 15	423	4.18	Weedy herbs.
*Bird's-foot Trefoil	*Lotus corniculatus*	beige/brown	**10** 11	720	4.10	Local weedy herb.
touch-me-not	*Impatiens*	cream yellow	**14** 15	305	3.93	Local weedy herb.
*dandelion-type	*Taraxacum-Hieracium*	orange	1 2 3 4 5 **15**	1038	2.86	Local weedy herbs.
*Loosestrife	*Lythrum salicaria*	green/purple	**12**	287	1.81	Local weed naturalized in wetland forest.
*crowfoot family	Ranunculaceae	red/purple	5	156	1.53	*Ranunculus* has local weedy herbaceous species.
*willow *p.p.*	*Salix*	yellow/orange	1	121	0.86	Local ornamental trees.
*burdock	*Arctium*	yellow/orange	12	107	0.72	*A. minus* is a local weedy herb.
ragweed	*Ambrosia*	yellow	15	40	0.45	*A. artemisiifolia* is a local weedy herb.
*honeysuckle *p.p.*	*Lonicera*	yellow/orange	3 4	32	0.29	*L. tartarica* local ornamental shrub, sometimes escaped.
*Blue-weed	*Echium vulgare*	purple	7 8	37	0.24	Local weedy herb.
*Horse-chestnut	*Aesculus hippocastanum*	white/yellow	10	26	0.20	Local ornamental tree.
elderberry	*Sambucus*	orange	11 12	20	0.13	*S. canadensis* local weedy shrub.
*pink family	Caryophyllaceae	dark green	7	26	0.13	*Silene* and *Saponaria* common herbaceous weed species.
aster subfamily	Tubuliflorae	red/purple	8 15	13	0.07	Herbs, often weedy.
*thistle	*Cirsium*	white/yellow	11	4	——	*C. arvense* common local weedy herb.
unidentified				13	——	
Total				13565	138.27	

fidelity an individual honey bee has for a plant species. The minor pollen in a pellet is best attributed to surface contamination from other bee loads; all of the minor pollen was of a type present in the weekly collection.

Our foraging pattern results generally compare with those of Adams et al. (1978). They identified 46 taxa while we found only 25 taxa. However, their collection period began in April and extended into October. Due to our shorter trapping season, we missed, for example, the early maple and Skunk Cabbage (*Symplocarpus foetidus*) of March and April and the late Witch Hazel (*Hamamelis virginiana*) of October. There were notable differences in pollen percentages between studies; for instance, we found abundant Alfalfa-Black Medick and Nannyberry, but these were minor in Adams et al. (1978). On the other hand, they found willow and aster subfamily to be abundant whereas we found them to be uncommon; our dearth of willow is probably due to a later collection start. Another difference between the two studies is that there are some pollen types that were present in our study, yet were absent in theirs, such as spurge, bellflower and ragweed. Because bellflower is a garden plant, perhaps it is localized in Guelph but was not grown in the foraging area near Brantford. Also, there were numerous pollen types reported by Adams et al. (1978) which were absent in our collections, e.g. sumach, a weedy shrub, was only found near Brantford and not in the Guelph foraging area. The results of our study and the subsequent comparison of data collected by Adams et al. (1978) indicate the strong regional differences in the forage available to Honey Bees even though the locations of the two studies are close in proximity.

The results of this study also indicate that of the 25 plant taxa identified, Honey Bees tend to forage most heavily on introduced taxa even when native plant species that require insect pollination are available as forage. Of 13 565 pellets identified, 82% came from introduced taxa while the remaining 18% came from native species. Similarly, 85% by weight were gathered from introduced taxa and 15% from native species. It is possible that Honey Bees, a species introduced to North America in the 1600s, preferentially forage on introduced plant species many of which evolved in Europe along with the Honey Bee.

Honey Bees generally forage on plants adapted to insect pollination but during this study forager bees collected 40 pollen pellets containing pollen grains from ragweed which is wind-pollinated.

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