SOME OBSERVATIONS ON POLLINATION OF ALFALFA HAY

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During the summer of 1948, observations were made on the prevalence of pollinating insects in several alfalfa fields in the vicinity of Stillwater, Oklahoma. In making these observations their abundance was determined by counting the number of pollinating insects that could be collected per sweep with a sweeping net. These collections were made by sweeping the plants, walking through the field at ordinary walking rates. All sweeps were made in front of the person doing the collecting. The sweepings were made in different fields at various times and as a rule about the time that the alfalfa plants were beginning to blossom. It was not possible to make the sweepings throughout the blossoming period because the crop would be cut for hay about the time the plants came into full blossom. The 1948 season in the vicinity of Stillwater was not a good season for alfalfa seed production. While data for comparison are not available, it is, however, believed that the plants did not blossom as profusely as is normal for this vicinity. As a rule, the third crop is used in seed production, and that crop did not produce an average seed yield during the summer of 1948. In addition to the poor showing there was also a serious outbreak of blister beetles and webworms.

TABLE I

Distribution of Pollinating Insects Collected by Sweeping Alfalfa Fields. Stillwater, Oklahoma, 1948

Date	No. of Sweeps	No. of Honey Bees	No. of Native Bees	No. of Other Pollinating Insects	No. of Megachile Bees
June 20	150	36	4		
July 21	350	16	21	5	
July 23	300	31	12	1	
July 28	150	19	9	2	5
July 29	100	1	36	0	2
Aug. 3	100	8	5	1	2
Aug. 5	100	11	8	0	2
Aug. 16	200	0	46	2	2
Aug. 19	200	0	59	1	0
Aug. 31	100	0	8	0	0
	1750	122	208	12	13

Counts made by sweeping during the season (Table I) showed that honeybees were most abundant in alfalfa fields during the early part of the summer, whereas native bees of all species were more abundant during middle and late summer. The megachile bees seemed to be most abundant during mid-summer, but disappeared in late summer.

Of all the pollinating insects collected through the season, more than one-half were honeybees. In addition to the native bees such as bumblebees, megachiles and several other species of solitary bees, it was also noted that hover flies and other syrphid flies likewise visited and sometimes tripped the blossoms. Observations on their efficiency as a tripping agent could not be made with hover flies due to their erratic flight and the ease with which they were disturbed. The megachiles, however, were observed as being very efficient in tripping the blossoms, sometimes tripping as high as 90 percent of the blossoms visited.

In addition to observations on abundance of pollinating insects by sweeping, observations were also made on the efficiency of honeybees as a tripping agent as well as to the number of blossoms visited and the length of time spent at each blossom. These data are shown in Tables II and III.

TABLE II

Number of Alfalfa Blossoms Tripped by Honeybees. Stillwater, Oklahoma, 1948

Date	No. of Flowers Visited	No. of Flowers Tripped
July 23	110	15
July 23	110	11
July 28	92	15
Aug. 3	13	0
Aug. 3	20	2
Aug. 5	19	0
Aug. 5	22	3
Aug. 5	5	0
Aug. 5	12	1
Aug. 5	23	3
Aug. 5	16	3
Aug. 5	21	2
Aug. 5	19	1
	479	49

In making the observations on the efficiency of honeybees, the procedure was to go into the field and find a bee, follow it as it went from blossom to blossom, and note the number of blossoms visited and the number that were tripped. In most instances, it was impossible to follow the same bee for any length of time before it became disturbed, or disappeared due to some other cause. Due to this unpredictable habit of the honeybee, it was only possible to follow a single bee while she visited from 5 to 30 blossoms. These observations showed that slightly more than 10 percent of all the blossoms visited were being tripped. In making these observations in the vicinity of a bee-yard where both three-banded Italian and Caucasian bees are kept and in the flight range of the bee, there was an indication that of the two races the Caucasians were more efficient as a tripping agent.

TABLE III

Number of Alfalfa Blossoms Visited by Honeybees. Stillwater, Oklahoma, 1948.

Date	Time in Seconds	No. of Blossoms Visited
July 23	15	6
July 23	80	20
July 23	186	55
July 26	90	30
July 28	107	32
July 28	111	26
Aug. 3	36	13
Aug. 5	95	25
Aug. 5	230	57
Aug. 5	105	19
Aug. 5	74	16
Aug. 5	23	7
Aug. 5	19	4
Aug. 5	96	33
Aug. 5	56	16
	1403	359

1403 ÷ 359 = 3.9 seconds per blossom.

The third phase of observations made in the field is reported in Table III. In making these observations a stop watch was used to record the time in seconds. It was necessary to find a bee, then follow her in her flight from blossom to blossom as long as possible. When the bee flew out of sight, the watch was stopped, the time and number of blossoms visited was recorded, after which another bee was found for further observation. The time interval and the number of blossoms visited, therefore, represent the work of several different bees.

It is interesting to note that the bees spent an average of 3.9 seconds with each blossom visited.

Early in June, nine cages made up of three different sizes of screen were placed over alfalfa plants to determine the pollinating effect of insects. In one cage, the screen was 16-meshes per inch and excluded all but the very smallest insects. The second was made up of ¼-inch mesh hardware cloth and excluded insects as large as bumblebees, but would permit honeybees to enter. The third was ½-inch mesh hardware cloth and permitted even bumblebees to enter. Each of the mesh-size cages was replicated three times. In addition to this, two longer cages 6 feet square and made of 16 mesh screen wire were placed in the field. A colony of bees was placed into each cage so that ½ of the hive was inside the cage and ½ on the outside. The bees had access to the plants inside the cage through a back opening in the hive. All other insects were excluded from the hive as the cage fitted tightly around the hive and only those insects which might venture through the hive could gain access to the caged plants. It can be assumed with a fair degree of certainty that any seed set inside the cage was due to honeybee activity. The final counts of these tests are given by pods per stem in uncaged plants as well as for each of the cages. Table IV shows the number of seed pods developed per stem in each of the cages as well as for nearby uncaged plants.

TABLE IV

Seed Pods Produced per Stem for Caged and Uncaged Alfalfa Plants. Stillwater, Oklahoma, 1948.

Treatment	No. of Stems	No. of Seed Pods	Seed Pods per Stem
½ inch mesh	500	514	1.1
¼ inch mesh	430	204	.47
16-mesh	500	86	.172
16-mesh with hive of bees	300	1447	4.82
16-mesh with hive of bees	300	561	1.2
Check — no cage	500	296	.59