POLLEN FEEDING BY OVERWINTERING BOLL WEEVILS

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Abstract

Pollen analyses were used to determine alternative foraging resources of boll weevils, Anthonomus grandis Boheman (Coleoptera: Curculionidae), in Uvalde Texas from April - July, 1995. There were 156 different pollen types encountered within the samples: 131 types were identified to the family, genus, or species ranks, and 25 remained unknown. Pollen representing 44 families, 86 genera, and 14 species occurred in the samples. Boll weevils captured in April contained the greatest number of pollen grains and pollen types. Those captured in June had the fewest. Boll weevils foraged on the greatest number of alternative foraging resources in April, and the fewest in June. Pollen types from the Asteraceae, Fabaceae, Poaceae, and Rhamnaceae occurred in each month. The Fabaceae represented more pollen types (33) than any other family, followed by the Asteraceae (22). The Malvaceae did not occur until June, and was found in both June and July. Our research showed that boll weevils in Uvalde, Texas have a wide range of alternative foraging resources.

Introduction

The boll weevil Anthonomus grandis Boheman (Coleoptera: Curculionidae) invaded the United States about 100 years ago. Today boll weevils have spread to all cotton growing areas in the United States and are a major cotton pest. This year the boll weevil eradication program became a United States nation-wide program to combat the boll weevil.

According to some researchers, this all out program will eradicate the boll weevil from all cotton producing areas in the United States. Boll weevil eradication is partially based on the premises that the preponderance of boll weevils enter cotton before the first square or they die from starvation. Many scientists believe that boll weevils forage only on cotton and a very few other taxa. Recent studies have indicated that the adult stage has a wide range of foraging resources. Stoner (1968) found adult boll weevils foraging on Sphaeralcea spp. (Malvaceae), globe mallow, in Arizona. In Texas, Rummel et al. (1978) found adults feeding on Hymenopappus sp. (Asteraceae), woolly white. Cate and Skinner (1978) reported that pollen could be found in the boll weevil gut and that the identification of this pollen could indicate alternative foraging resources. From pollen analyses, Benedict et al. (1991) and Jones et al. (1993) found that boll weevils are not as restricted or specific in the species they forage as was previously believed.

In addition, preliminary research at USDA, Areawide Pest Management Research Unit indicates that Texas boll weevils remain active year around residing in thickets and brushy areas. We wanted to determine if boll weevils in Uvalde, Texas foraged on plants other than cotton.

Methods and Procedures

Boll weevils were collected in pheromone traps just north of Uvalde, Texas. Five Traps were placed about 1 mile apart along four lines radiating out from three cotton fields. Eighteen of the boll weevils captured in April, May, June, and July from sites 2 and 5 of each line (about 2 and 5 miles away from the cotton fields respectively) and Field 3 were examined for pollen.

A whole boll weevil was placed in a 12 ml glass centrifuged tube and chemically dissolved. This chemical processes destroys the boll weevil tissue but not the pollen. Three slides were made from each boll weevil's pollen residue. The pollen residue was examined using light microscopy. Light micrographs were taken of all pollen types. Pollen types were identified to the lowest classification possible; family, genus, or species. All pollen identification was made utilizing Gretchen D. Jones' and the Areawide Pest Management Research Unit's pollen collections.

Results

A total of 2271 pollen grains were counted in the boll weevil pollen residue samples (Table 1). One hundred fifty-six (156) pollen types were found in the samples. Of those types, 131 were identified to family, genus, or species ranks, and 25 remained unknown. Pollen representing 44 families, 86 genera, and 14 species were identified within the samples (Table 1).

Samples from the month of April not only had the greatest number of pollen grains, but also the greatest number of pollen types (Table 2). Both April and July had the same number of families. June had the fewest number of pollen grains, pollen types, and families.

Thirty-three (33) taxa of the Fabaceae were found in the samples including several species of Acacia, Mimosa, Neptunia, and Trifolium. The Fabaceae represented more pollen types than any other family. Following the Fabaceae in the number of pollen types was the Asteraceae. Twenty-two (22) taxa of the Asteraceae were represented in the boll weevil samples. The Poaceae was represented by five different pollen types. There were four different Rhamnaceae found in the samples, including Frangula caroliniana (T. Walter) A. Gray (Syn = Rhamnus caroliniana T. Walter), buckthorn. The Malvaceae did not

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occur until June, and were found in both June and July. However, they were never a major pollen constituent. This may be in part due the fragility of the pollen grain itself.

Frequency of occurrence is the number of samples in which a pollen type occurs divided by the total number of samples, then the resultant is multiplied by 100. Frequency of occurrence indicates how often a pollen type will be encountered within the samples. In other words, in the month of April, members of the Asteraceae are expected to occur within the samples 56% of the time (Table 3). Pollen types from the Asteraceae, Fabaceae, Poaceae, and Rhamnaceae were all found in each month. Because of the nature of blooming periods, a family may occur in one month and not in the others as in the Alismataceae and Fagaceae (Table 3). In the overall total, the Fabaceae were encountered most frequently followed by the Asteraceae, Rhamnaceae, and Fagaceae.

Relative frequency is the number of samples in which a pollen type occurs divided by the total number of taxa, then the resultant is multiplied by 100. Relative frequency indicates the importance of a pollen type within the sample. The relative frequency of the most frequently encountered families was calculated (Table 4). The Fagaceae were the most important family in the month of April. In May, the Fabaceae were the most important, but in June and July it was the Rhamnaceae.

Our research shows that boll weevils have a wide range of alternative foraging resources. In April they foraged on the greatest number of alternative foraging resources from oaks (Fagaceae) to acacias (Fabaceae). However, boll weevils had fewer foraging resources in the month of June. June is a rather dry month in Uvalde, Texas and is also a transition month between spring and summer flowering plants. The spring plants have finished flowering and the summer plants have not begun to flower. Once the rains begin the end of June and beginning of July, the number of foraging resources increases.

In conclusion, the most important alternative boll weevil foraging resources are members of the Asteraceae, Fabaceae, Fagaceae, and Rhamnaceae. Pollen feeding provides significant energy and nutrition for dispersing boll weevils. Because of the variety of alternative foraging resources found in Uvalde, it is important to examine boll weevils from other areas. At the present time, research is being conducted in Munday and Crockett, Texas, to determine additional alternate foraging resources.

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Table 1. The total number of pollen grains, pollen types, identified and unidentified pollen types found in all Uvalde boll weevil samples examined.

2271	Pollen Grains
156	Pollen Types
131	Identified
25	Unknown
44	Families
86	Genera
14	Species

Table 2. The number of pollen grains, pollen types, and families by month found in Uvalde boll weevils.

Month	# Grains	# Types	# Families
April	1364	89	26
May	363	59	23
June	253	38	17
July	291	56	26
Total	2271	156	44

Table 3. Frequency of occurrence by month and overall total of pollen found in boll weevil samples.

Family	April	May	June	July	Total
Alismataceae	39				10
Apocynaceae	39				28
Asteraceae	56	44	17	50	42
Cupressaceae	44	39	17		25
Fabaceae	89	72	33	50	61
Fagaceae	94	50			36
Juglandaceae			17	61	20
Moraceae	83	22		11	32
Poaceae	28	6	11	44	22
Rhamnaceae	28	33	39	50	38

Table 4. Relative frequence of the most frequently encountered families in the pollen analyses of Uvalde boll weevils.

Family	April	May	June	July
Asteraceae	38	35	18	35
Fabaceae	62	57	35	35
Fagaceae	65	39		
Rhamnaceae	19	26	41	37