The Genus Agastache as Bee Forage: A Historical Perspective

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The Genus Agastache as Bee Forage: A Historical Perspective

by GEORGE S. AYERS and MARK P. WIDRLECHNER

"We believe the potential benefits of commercial Agastache cultivation for the beekeeping industry are quite exciting."

The September 1992 and January 1993 "The Other Side of Beekeeping" requested reader input about experiences with anise hyssop. This series of articles is our response to your replies. Most who made plantings were disappointed, yet historically, very competent apiculturists thought very highly of anise hyssop. In addition, our experiences with this plant and several closely related species make us ponder why the responses were not more positive. In this article, we review the history and biology of the genus Agastache as a bee forage. In the second article of the series, we will use this information to speculate on some reasons for anise hyssop's poor showing in most plantings. In the final article, we will provide advice for those who would like to try growing anise hyssop.

Taxonomic overview

The genus Agastache belongs to the mint family, known in Latin as Lamiaceae or Labiatae. The latter name lost favor when a Botanical Congress recommended that all plant family names end in -aceae. This is the family to which peppermint, spearmint, sweet basil, oregano, catnip, lavender and many other herbs belong. Over the years, the genus Agastache was given other names, the most common being Lophanthus and Hyssopus. This can be confusing since at least Hyssopus is still a recognized genus name. To make the situation more confusing, plants in the genus Hyssopus are also known as hyssops, e.g., garden hyssop (Hyssopus officinalis L.). In addition, some are also good bee forage. Agastache species are often called giant hyssops and Hyssopus, simply hyssops. This is not, however, always the case. Often, the "giant" portion of the name is dropped for Agastache species. At other times, a specific Agastache species is simply referred to as giant hyssop.

The most recent taxonomic revision of the entire genus Agastache was completed by Lint and Epling (1945). The genus Agastache is divided into two sections. Seven species of the first section extend across most of northern United States and southern Canada with an eighth species occurring exclusively in eastern Asia. Most, if not all, of the apicultural literature pertaining to the genus refers to species from this section. The 14 to 19 species that comprise the second section originate in the arid regions of southwestern United States and Mexico. This group was revised taxonomically by Sanders (1987). We are unaware of any apicultural literature pertaining to this group. None is listed, for example, by Sanborn and Scholl (1908) in their Texas Honey Plants. Because of our experience with several species in the genus, we would not be surprised if these southwestern species were also attractive to honey bees.

Based on cross-pollination experiments (Vogelmann, 1985) and electrophoretic
enzyme analyses\(^3\) (Vogelmann and Gastony, 1987) the taxonomy of the North American species still seems unsettled. This uncertainty in scientific circles is carried over into the commercial seed trade, and seeds purchased under the name of one species may, in fact, be those of another. Even specimens in botanic gardens are often mislabeled.

Of the 20 North American species listed by Lint and Epling, only a few species appear in the beekeeping literature. By far, most references refer to \(A. \) \textit{foeniculum} (Pursh) O. Kuntze which is native to the northern Great Plains and western Great Lakes region\(^4\). This species is often referred to as fragrant [giant] hyssop or anise hyssop. The only references to other species in the beekeeping literature of which we are aware are for \(A. \) \textit{urticifolia} (Benth.) O. Kuntze, \(A. \) \textit{nepetoides} (L.) O. Kuntze, \(A. \) \textit{rugosa} (Fisch. & C.A. Mey.) O. Kuntze, and in rare instances, \(A. \) \textit{scrophulariifolia} (Wilde) O. Kuntze. Of these four, the first is the most commonly mentioned and comes from the Sierra Nevadas, eastern Cascades, Great Basin, and northern Rockies. This species is often called nettle-leaf [giant] hyssop. \(A. \) \textit{nepetoides} is an eastern North American species native to southern New England, the southern Great Lakes, Ohio River Basin and the Ozarks that is often referred to as yellow or catnip [giant] hyssop. \(A. \) \textit{scrophulariifolia} is also an eastern North American species whose range extends from southern New England south to western South Carolina and west to northern Missouri and southern Minnesota. It is often referred to as purple [giant] hyssop or figwort [giant] hyssop. \(A. \) \textit{rugosa} is the only Asiatic species and is often called wrinkled [giant] hyssop or Korean mint. Only rarely do we find references to \(A. \) \textit{rugosa} in the beekeeping literature and these largely from our own writings. We find this a little curious since studies at both Michigan State University and the North Central Regional Plant Introduction Station indicate that \(A. \) \textit{rugosa} is an exceptional bee forage. Our lack of information pertaining to \(A. \) \textit{rugosa} may result from our inability to track the Asiatic literature as well as that of North America. We would be surprised, however, if the Chinese and Japanese are unfamiliar with its attractiveness to bees.

\[\text{Agastache nepetoides is an eastern North American species native to southern New England, the southern Great Lakes, Ohio River Basin and the Ozarks that is often referred to as yellow or catnip [giant] hyssop.} \]

\[\text{Agastache scrophulariifolia is also an eastern North American species whose range extends from southern New England south to western South Carolina and west to northern Missouri and southern Minnesota. It is often referred to as purple [giant] hyssop or figwort [giant] hyssop.} \]

\[\text{Agastache rugosa is the only Asiatic species and is often called wrinkled [giant] hyssop or Korean mint.} \]

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\[\text{We would be surprised, however, if the Chinese and Japanese are unfamiliar with its attractiveness to bees.} \]

\[\text{Review of the less commonly mentioned species as bee forage} \]

\[\text{Vansell (1933) described a honey surplus of 100 lbs. per hive in Eldorado County, California during July of 1931 from A. urticifolia.} \]

\[\text{Interestingly, while the species appeared equally abundant and vigorous in 1932, honey bees paid no attention to it. It was, however, visited freely by bumble bees, carpenter bees, butterflies and hummingbirds. Curiously, the same author does not mention this species in his Nectar and Pollen Plants of California (Vansell, 1931).} \]

\[\text{Scullen and Vansell (1942) mention the species in their Nectar and Pollen Plants of Oregon only to say "Usually out of range of bees."} \]

\[\text{Burgett et al. (1989) simply quote Scullen and Vansell. We believe the correct interpretation of this phrase to be that the species grows where few honey bees exist, but it may also mean that the nectar is out of reach of the honey bee's tongue. The latter explanation might explain the 1932 visitation pattern reported by Vansell (1933).} \]

\[\text{Nye (1971), in his Nectar and Pollen Plants of Utah, mentions A. urticifolia as a honey plant of minor importance in Utah. It is not, however, mentioned in the earlier Nectar and Pollen Plants of Utah by Vansell (1949). Oertel (1939) in his Honey and Pollen Plants of the United States lists a hyssop species from Nevada as honey plants. We believe these are most likely A. urticifolia, but they could also be one or more of the southwestern species mentioned earlier. Pellett mentions the species in only the 1947 edition of his American Honey Plants\(^5\).} \]

\[\text{Pellett (1920, 1923, 1930 and 1947), J. H. Lovell (1926), H. B. Lovell (1956 and 1966) and Pammel and King (1930) mention A. nepetoides as being very attractive} \]

\[\text{About the Coauthor} \]

I first met Mark Widrlechner about 1985 when he started a bee forage project at the USDA/ARS North Central Regional Plant Introduction Station, located at Iowa State University, Ames. Mark has been employed by the U. S. Department of Agriculture, Agricultural Research Service as the North Central Regional Plant Introduction Station’s Horticulturist since 1983. There are four Plant Introduction Stations in the United States, whose major duty is to serve as germplasm banks for agricultural and horticultural crops and for other plants with economic potential. These stations safeguard much of the genetic material upon which future crop improvements will be based. Each Station specializes in a particular set of species represented by collections from diverse origins. Each collection from a particular origin is known as an accession. Mark’s Station keeps nearly 40,000 different accessions of field crops, forages, vegetables and ornamentals. As accessions age, or as they are used by researchers worldwide, seed supplies must be renewed. Each accession is planted and pollinated and the resulting seeds are harvested and placed into cold storage. So that genes from a particular accession are not contaminated by genes from other accessions, they are either pollinated by hand, or placed under cages and pollinated by a nuc of bees (see Fig. 1). This use of honey bees is rather unusual and is explained in detail by Ellis et al. (1981).

The Plant Introduction Station at Ames uses approximately 1000 cages each summer. Bees in cages collect very little nectar so these nucs must be fed. This laborious process during the heat of mid-summer could be reduced if suitably high quality bee forage could be found. That was the inspiration for Mark’s bee forage project. He began with a screening program to identify highly productive bee forages. Because there were concerns about introducing new species into the U. S. that might become serious weeds, Mark focused on our many native plant species. Many native mint-family plants were found to be among the most promising species. After an initial three-year screening period, he has expanded the project to look for other potentially economically important traits in these plants. The main article gives more details about this interesting program.

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to bees. They do not, however, appear to imply that it is an important bee forage. Robinson and Oertel (1975) list A. foeniculum from their northern and southern U.S. regions which included all of the United States west to, and including, Minnesota and Louisiana. Agastache foeneculum was also listed from eastern Canada, which included Ontario and eastern Canada. Agastache foeneculum as an important honey plant of the Northeast and North Central States. We believe that these references to A. foeniculum as a honey plant of eastern North America are probably better ascribed to A. nepetoides and/or A. scrophulariifolia, since A. foeniculum would be found only along the most western edge of this region. Although it is possible that these reports could represent plantings of A. foeniculum, we feel this is unlikely because there was little planting for honey production during this period.

Jabłoński (1986) in Poland, using the capillary method, estimated the honey potential of A. rugosa to be 616, 430, 706 and 404 lbs/acre for the years 1980, 81, 83, and 84, respectively.

Pammel and King (1930) mention A. scrophulariifolia as being attractive to bees.

Review of anise hyssop as bee forage

In American Bee literature, anise hyssop is often given the scientific name A. anethiodora. Less often it is referred to as A. anethiodorus, A. anisatus or A. anisata. There is also literature in which these names are misspelled. These are all invalid names for A. foeniculum which is based on Parsch's first valid scientific description of this species.

Anise hyssop under cultivated conditions

Although Pellett did not mention A. foeniculum in the 1920 edition of his American Honey Plants, the 1923 edition acknowledges its attractiveness to bees. Each succeeding edition (Pellett, 1930 and 1947) expanded on this topic.

Based on observations made during a 1925 trip to Canada, Pellett (1926) describes anise hyssop as being "...a very important source of surplus honey for the beekeepers of western Canada. As common in the bush regions and on the margins of prairies all the way from Winnipeg to Edmonton." In this article, he reported that beekeepers near Red River, Manitoba were harvesting large quantities of honey from the species and that 40 percent of the honey harvested near Edmonton also came from anise hyssop. A sample sent to him from the Edmonton area was in his words (Pellett, 1926), "...of especially fine quality, with a peculiar minty flavor. The honey was thick, with heavy body and light color, a product that would command attention in any market." Interestingly, Mitchener (1948) does not mention Agastache in Nectar and Pollen Producing Plants of Manitoba.

Oertel (1939) lists A. foeniculum as a honey plant of North Dakota. Wilson et al. (1958) in their Nectar and Pollen Plants of Colorado found A. foeniculum to be "one of the most attractive plants to honey bees" that they had encountered. Robinson and Oertel (1975) lists A. foeniculum as a honey plant of western Canada. It is possible that their accounting may also represent A. urticifolia at least in part.

Anise hyssop under wild conditions

Because of his extensive writing on the subject, Frank Pellett (1879-1951), more than anyone else, created a place in U.S. apicultural history for A. foeniculum. Mr. Pellett was a well respected apiculturist. He was the Iowa State Apiarist between 1912 and 1917, a Field Editor of the American Bee Journal for many years, and then an Associate Editor of the same publication, a position he held until the end of his life. He was instrumental in the pioneering research on American foul brood. He initiated and operated the American Bee Journal's Honey Plant Test Gardens at Atlantic, Iowa. He was a careful observer who published books on the history of American beekeeping, queen rearing, practical beekeeping, horticulture, botany and ornithology (Anonymous, 1951), but he is probably most remembered by today's beekeepers for his magnum opus, American Honey Plants, which he revised several times through his life (1920, 1923, 1930, and 1947). His proclamations about bee forage in general (and anise hyssop in particular) demanded the respect of the apicultural industry.

While it was Frank Pellett who created a place in apicultural history for anise hyssop, his interest was sparked by a much earlier writing by H. A. Terry (1872) in which Terry proclaimed his belief that "an acre of this plant well established would be ample pasture for 100 swarms of bees." Pellett, himself of considerable apicultural stature, had the greatest respect for Mr. Terry, as indicated by the following quote (Pellett, 1940b): "In the pioneer period of Iowa history there lived in Pottawattamie County a grand old man who was a beekeeper and horticulturist. He left behind him a record of achievement which insures that he will be remembered long after most men of his time are forgotten." While the current authors believe that the "100 swarms/acre" is an extravagant claim, Terry, who was apparently a competent horticulturist and beekeeper, obviously found an Agastache species to be an exceptional honey plant.

More extensive portions of the 1872 Terry article than provided here can be found in several writings (Pellett, 1923, 1930, 1943 and 1947; Pammel and King, 1930 and Stringer, 1990), and the "100 colonies/acre" estimate is mentioned in many publications. With the exception of Pellett, apparently few who have quoted parts of the Terry article have actually seen it. When Pellett provided extensive sections of the 1872 article for his readers, he, for some reason, changed the original wording, "100 swarms" to "100 colonies" without telling the readers that he had done so. All of the quotes with which we are familiar use the "100 colonies" wording. These "blind quotations" have helped perpetuate two probable myths about anise hyssop. The first of these concerns the actual species about which Terry was writing. The seeds for Terry's planting were obtained from the Rocky Mountains as indicated by the following quote from the original paper (Terry, 1872). "Sophanthus anisatus [the scientific name Terry used].
find it no plants were to be found. Apparently it had disappeared completely from the region along with the Indian and the bison with which it had been associated.” This belief seems to be based on the premise that the plants with which Terry was working were indigenous. As we have pointed out, they apparently were not. The herbarium records at Iowa State University for the years 1880-1930 indicate that *Agastache* had been widely collected through the period. There are numerous records for both *A. scrophulariifolia* and *A. nepetoides* recorded from widely distributed locations within Iowa. Only three records, however, exist for *A. foeniculum* during that same period and all were from Emmet County in the extreme northern part of the state. This species, which is currently on Iowa’s Endangered Species List (Roosa et al., 1989), has been collected from only 6 counties in the state, four of which are clustered in the extreme north central and northwestern part of the state. We conclude that there is no credible evidence that the species ever was common in the parts of Iowa where Frank Pellett and Terry lived.

When Pellett attempted to find a source of anise hyssop, he had considerable difficulty (Pellett, 1940a, 1940b and 1943). Eventually when *A. foeniculum* was obtained from western Canada, it was apparently much less common than it had been during Pellett’s 1925 trip. Pellett speculated that the settlers’ livestock had found the fragrant foliage so attractive that it had been destroyed by grazing. Other forms of habitat destruction, such as agricultural drainage and plowing of the prairies, probably also contributed to its disappearance.

From Pellett’s description (1946), we judge it was 1939 when anise hyssop was first introduced into the American Bee Journal’s Honey Plant Test Gardens. Initially, plants were obtained from the Valley River area of Manitoba approximately 180 miles north of Winnipeg. Later, seeds were also obtained from South Edmonton, Alberta. The first results from the Honey Plant Test Garden regarding anise hyssop were made public in 1940 (Pellett, 1940a and 1940b). From the beginning, Pellett was greatly impressed with the plant which he began to refer to as the “wonder honey plant.” After eight seasons of observations, Pellett had this to say about anise hyssop (Pellett, 1946), “Each year since [its introduction] we have increased the size of the plots and always the bees work the flowers more consistently than any other of the 500 plants tested in the honey plant garden. The bees visit the flowers from dawn to dark in wet weather and dry weather from June to October.” In this 1946 article, he provides comments from 12 beekeepers who had tried growing the species. He apparently considered these a representative sampling of the many replies he had
Counting bees in the experimental bee forage plantings at the North Central Regional Plant Introduction Station.

received. Of the 12, eight enthusiastically endorsed anise hyssop as a superb honey plant, one indicated that it was unattractive to honey bees, one indicated it was very attractive one year in five, one indicated it had been very attractive in one year of the two he had tested it, and one indicated that it had been very attractive to bumble bees, but not to honey bees. We will have more to say about this last observation in the July column.

After Frank Pellett's death in 1951, comments about anise hyssop, written by his son Melvin, appear in the American Bee Journal until the mid 1960's. The implication of these articles is that most, but not all, beekeepers found anise hyssop to be a superior bee forage. In one of these writings, M. Pellett (1965) seems to indicate that a disproportionately high number of the unenthusiastic reports came from the eastern United States.

In 1982, Mayer et al. published a paper that suggested that, in the dry area east of the Cascades in Washington, anise hyssop would "yield a surplus of 100 to 125 pounds of honey per colony with 25 colonies per acre." That translates into 2500 to 3125 lbs. of honey per acre. The authors of this article give credit to a beekeeper named John Eckstrom for being "the local leader in the development of land-based beekeeping." Conversations with two of the authors confirm that the estimates provided in the article were largely those of Mr. Eckstrom. Personal conversations with Mr. Eckstrom indicate that the estimates were based on the number of hives present at the approximately three acre planting, and his estimates of the individual hive weights. From what the authors of the 1982 paper observed, (number of hives and their estimates of the approximate weights of those hives), Mr. Eckstrom's estimates appeared quite reasonable. Personal conversations with both the authors and Mr. Eckstrom indicate that there was little else in the area for bees to work. The study area was east of the Cascades where, we estimate from precipitation maps from the Climatic Atlas of the United States (U.S. Dept. Commerce, 1968), approximately eight inches of precipitation falls annually. Consequently, if land in that region is not irrigated, it produces little for bees. Although alfalfa was being grown in the area of the Agastache planting, it is cut too early, as is the region's practice, for bees to make use of it. Alfalfa grown for seed, however, could contribute significantly to an incorrect apparent production of the anise hyssop field. Personal communications with the authors of the Mayer et al. paper and with Mr. Eckstrom indicate that there were no such plantings near the Agastache test planting.

In 1983, Lord published an article, in response to Mayer et al. (1982), entitled Anise Hyssop Not a Panacea. In this paper, he introduces a project at North Carolina State University designed to study the feasibility of growing anise hyssop for honey production in North Carolina. Like many others, his project experienced difficulty in getting good plant stands by direct field seeding. This project was discontinued two years after its initiation because the planting did not compete well with local weeds (personal communication). He pointed out correctly that the plants in the Mayer et al. (1982) paper had been irrigated. In the same paper, he also reported that an "independent source" claimed that the hives used in the Washington study were double-queened. While this seems a reasonable way to maximize the yield from a planting, personal conversations with Mr. Eckstrom indicate this was not the case. The brood chambers, however, consisted of two deep supers and may have been the source of this misconception. With the exception of the paper by Mayer et al. (1982), little appears in the literature concerning the honey potential of anise hyssop. Jabłoński (1989 and 1990), using the capillary method of nectar analysis, analyzed the honey potential of a planting of A. foeniculum in Poland during the years

6 During communications with Mr. Eckstrom, upon whose work the Mayer et al. article is based, he hastened to point out that the production estimates represented total production and not harvested yields. They do not account for overwintering needs.
1986 through 1988. In this study, the honey potentials ranged from 373 to 1236 lbs/acre with an average of 638 lbs/acre. The September 1992 issue of this column discusses the techniques and pitfalls for obtaining honey potentials. It also cites literature values for honey potentials for some exceptional honey plants against which Jabłoński’s data may be compared. Again, anise hyssop appears to be a very productive honey plant.

Apparently, during both the Pellett era and after the Mayer et al. (1982) publication, anise hyssop was planted frequently. Pellett Gardens at Atlantic, Iowa distributed seeds of anise hyssop, as well as of many other honey plants, for many years. Their ads in the Classified Section of both Gleanings in Bee Culture and the American Bee Journal first appeared in 1944 and ran till 1981. The 41st and last annual catalog of Pellett Gardens was issued in 1983. For several years after that, limited quantities of seed were available by special request. We have no idea how much anise hyssop seed was sold over that period, but it must have been a considerable amount. The prices were always very reasonable and the quantities supplied were generous. A 1946 catalog offers a packet of seed for $0.20. By 1983, this price had risen to only $0.95. The packets that one of us (Ayers) purchased toward the end of the existence of Pellett Gardens contained hundreds and perhaps over a thousand seeds.

In 1982, stimulated by the Mayer et al. (1982) article, advertisements for anise hyssop seed started appearing in the classified section of the American Bee Journal. These ads continued till 1989. Mr. Eckstrom, who we judge to be the main supplier over this period, estimates that he sold seed to approximately 100 beekeepers. We have not contacted the other seed producers. The species was offered again in the Classified Section of the American Bee Journal and Gleanings in Bee Culture during 1992 and continues to be offered today in both journals. Clearly, fair numbers of beekeepers have tried raising anise hyssop since the 1982 Mayer et al. publication. The responses to our requests for information about anise hyssop, upon which we will report in the July issue of ABJ, are based on plantings made during this period. One nagging and disturbing feature throughout this is that we do not find any reports by beekeepers who made large-scale plantings of the species with good results. Unfortunately, it is unclear how large the plantings were of the individuals about whom the Pellets periodically reported. Lovell (1966), comments that an Iowa beekeeper planted several acres of the species and concluded that his bees visited no other species while his anise hyssop was in bloom.

While we know of no other successes reported in the literature, Ayers and Harman (1992), in their survey of the honey plants of North America, list an Agastache species as a nectar and pollen plant from parts of Maryland, North and South Carolina and a small portion of Missouri. This was probably A. foeniculum since the respondents indicated it was cultivated for honey production at the time. We speculate that the stimulus for these plantings came from the Mayer et al. (1982) publication.

**Current U.S. anise hyssop projects**

We head the only two current anise hyssop research projects we know of in the United States: one at Michigan State University and the other at the USDA/ARS North Central Regional Plant Introduction Station at Iowa State University at Ames, Iowa. The Michigan State University project is investigating only in the apicultural aspects of the species. Ayers et al. (1987) reported tests of numerous species of potential bee forage which demonstrated that anise hyssop was quite attractive to bees compared to several other quality forages (see Fig. 2). Because of its attractiveness to bees, Ayers et al. (1991) used anise hyssop as part of an experimental diversionary planting for studying the potential of diverting bees away from areas of high pesticide risk. In that study, the bee population during the anise hyssop flowering peak was more than 8 bees per yd². This was clearly an attractive species in this study. In the January 1994 ABJ, this column described a new screening underway involving 17 accessions of A. foeniculum.

During 1994, and for the next several years, the emphasis at Michigan State will be on developing dependable establishment procedures that will be practicable by beekeepers. More will be said about this in the July column.

The project at the North Central Regional Plant Introduction Station began as a search for exceptional bee forage (see *About the Coauthor*), but now focuses on various aspects of the biology and potential uses of *Agastache*. From 1987 to 1989, 68 populations of nine different species of perennial mint-family plants were tested as bee forage at the Station in Ames. As was found in the screenings at Michigan State University, *A. foeniculum* and *A. rugosa* were the nectar sources most preferred by honey bees (Widlechner, 1992).

Before proceeding with additional selecting and breeding of improved populations of *Agastache*, a number of interesting questions began to surface. First, *A. rugosa* was fairly short-lived and many plants of this species wilted and died in the field. A strain of the fungus *Verticillium* was isolated from dying plants (Block et al., 1989). This finding was of more than academic interest because verticillium wilt has destroyed thousands of acres of commercial peppermint plantings in the north central U.S. since the 1920s (Nelson, 1950). Roger Fuentes-Granados, a graduate student at Iowa State University, recently evaluated 11 populations of *A. foeniculum*, two of *A. rugosa* and one of *A. nepetoides*, along with other mint-family plants, for reaction to the strain of *Verticillium* isolated from *A. rugosa*. He found that the disease was a much greater threat to *A. rugosa* than to *A. foeniculum* or *A. nepetoides* (Fuentes-Granados, 1993). We will discuss this finding further in the July column.

As *A. rugosa* died in the field, it was sometimes replaced by seedlings more vigorous than those of the original plants. Interestingly, these seedlings, which were heavily visited by bees, flowered over a longer period than did the *A. rugosa* they replaced (Widlechner, 1992). This led to more questions. What were these seedlings and were they useful?

Neil Senechal, a former graduate student in the project, used electrophoresis to study selected proteins from these unusual plants (Senechal, 1980) and found that they were all hybrids between *A. rugosa* and *A. foeniculum*. Insects foraging in the plots must have moved pollen from *A. foeniculum* to *A. rugosa* and the resulting hybrid seedlings outlived the maternal plants and then outcompeted the non-hybrid seedlings. It was also learned why they flowered over a longer period than did their parents. As first noted by Vogelmann (1985), hybrids between *A. rugosa* and *A. foeniculum* produce no seeds. Normally when *Agastache* plants begin to produce seeds they shift resources away from new flower production to seed production. Eventually, flowering stops almost completely. Because the hybrids produce no seed, this process never begins, flowering is not turned off, and the hybrids bloom till frost. Unfortunately, because they produce no seeds, these plants must be reproduced by division, cuttings or tissue culture. Although all three methods are experimentally feasible, none has yet allowed production of large numbers of selected hybrids.

**Genetic variation is the source of all plant improvement.** Vogelmann and Gastony (1987) found little variation within or among populations of *A. rugosa*. This could be a major hindrance to future breeding and selection programs. Was *A. foeniculum* in the same genetic cul-de-sac? Roger Fuentes, using similar electrophoretic techniques as did Neil Senechal, discovered that *A. foeniculum* had significant levels of variation both within and among populations (Fuentes-Granados, 1993). This suggests that...
breeding and selection for improved traits should be feasible for *A. foeniculum*.

The final focus of the North Central Regional Plant Introduction Station’s Agastache research is on understanding the variation in the potentially useful traits of flavor and aroma. Many related questions can be posed. How do *Agastache* plants vary in essential oil8 production? Are these differences under genetic control and do they affect attractiveness to honey bees? Interestingly, the first tentative descriptions of the chemical makeup of *Agastache* were completed at Iowa State University (then College) almost 50 years ago and were related to Frank Pellett’s work. Because of intense interest generated by Pellett’s research at the *American Bee Journal*’s Honey Plant Test Gardens, the Sioux Honey Association funded a study to determine the potential of anise hyssop as a commercial source of essential oils (Pellett, 1946). From this work, Pollet and Hixon (1945) published the first report of the major essential oil components of *A. foeniculum*. In the current project, researchers at the Plant Introduction Station work closely with researchers at several universities who are expert in modern techniques of essential oil analysis. The goal of this team project is to analyze the many components of essential oils that contribute to the distinctive tastes and aromas of these plants (Charles et al., 1991, Wilson et al., 1992).

Some of the constituents of anise hyssop’s essential oils resemble the pheromone emissions from the honey bee Nasonov gland, which are very attractive to honey bees under certain circumstances (Williams et al., 1981). This raises the question whether these essential oils are involved in the species’ exceptional attractiveness to honey bees. A technique called headspace analysis has been used to analyze the air surrounding *Agastache* leaves and flowers that have been confined within a sealed container (Wilson et al., 1992). These headspace samples simulate the aroma that a bee might experience near the plants. The suite of compounds that compose this aroma varies considerably from plant to plant and from population to population. It remains to be seen how this variability is controlled environmentally and genetically and how it affects honey bee preference.

Hopefully, the answers to these questions will set the stage for the commercial cultivation of *Agastache* in the United States as an herb or industrial crop, if not solely as a bee forage. In addition, the growing number of publications from outside the United States (Galambosi and Galambosi-Szabeni, 1992; Mazza and Kiehn, 1992; Menghini et al., 1992; Nykänen et al., 1989 and Weyerstahl et al., 1992) suggests that new markets for *Agastache* may develop quickly. We believe the potential benefits of commercial *Agastache* cultivation for the beekeeping industry are quite exciting.

**CONCLUSIONS**

The literature and data reviewed in this article suggest clearly that several species of *Agastache* can be exceptional bee forage under the proper circumstances. During the past 50 years, there were two periods during which interest in anise hyssop became intense. During both periods many beekeepers made plantings of anise hyssop. The disturbing feature of both periods is that despite the species’ apparent potential, reports of persistent, productive, large-scale plantings are almost totally lacking. These seemingly contradictory statements beg for an answer to the question, What is going wrong?

In the July issue of this column, we shall use the replies from readers who have recently planted anise hyssop to attempt to give some plausible answers to this question.

**REFERENCES**


8 Essential oils are the oils that give many of the mints their distinctive odor (essence) and flavor.
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