Imported Russian Honey Bees: Quarantine and Initial Selection for Varroa Resistance

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The Honey Bee Breeding, Genetics, and Physiology Laboratory of the USDA, Agricultural Research Service maintains the USDA-ARS Honey Bee Quarantine Station on Grand Terre Island, a barrier island just off the Louisiana coast. The Quarantine Station held various groups of imported queen honey bees during 4 to 6-month periods when federal and state regulatory agencies periodically inspected the shipments for diseases. Imports originated from the former Yugoslavia in 1989, Great Britain in 1990, and most recently, from the Primorye Territory of far-eastern Russia in 1997 and each year during 1999-2001. Most of the importations involved cooperative research agreements between our laboratory and an official scientific counterpart from the exporting country. Each importation required official permits from the Animal & Plant Health Inspection Service (APHIS) of the USDA, the Louisiana Department of Agriculture & Forestry (LDAF), and officials from the exporting country. The primary function of quarantine is to provide United States honey bee researchers with a mechanism to import experimental stocks, while protecting the United States beekeeping industry from diseases or parasites that may be carried by imported queen bees.

Introduction

The rationale for importing honey bees into the United States has focused on the potential resistance of the imported bees to the tracheal (*Acarapis woodi*) and varroa (*Varroa destructor*) mites. Both mites kill colonies of bees, and honey bee stocks in the United States have historically lacked resistance to these parasites. Varroa mites typically kill colonies within 1-2 years of initial infestation. Tracheal mites contribute to the death of overwintering bee colonies and have proved devastating to beekeeping operations that depend on winter-hardy bees.

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Our long-term goal is the release of beneficial germplasm to the United States beekeeping industry to provide genetically based mite resistance to control parasitic mites. Recently we released ARS Russian honey bees to the beekeeping public for use in breeding programs and production colonies (*ABJ* 140: 305-307). These bees exhibit significant resistance to both varroa and tracheal mites (*ABJ* 139: 287-290 and *Apidologie* 32: 381-394). They are the result of many years of selective breeding for varroa resistance in honey bees originating from the Primorye Territory of far-eastern Russia. Breeder queens are produced commercially by Bernard Apiaries, with whom we have established a Cooperative Research and Development Agreement.

Interest in Russian honey bees began in the mid-1990's when we evaluated the potential resistance to varroa mites in a population of honey bees that may have had the longest exposure to the mites (*Bee World* 59: 164-167), based on historical records. A field test in 1995 showed that colonies of bees in Russia grew lower populations of varroa mites than did similarly sized colonies in the United States (*ABJ* 135: 746-748). Although differences in mite growth could have been caused by environmental factors, we recognized the possibility that a genetic basis might explain lower growth of mite populations in Russian bees. Hence, in 1997 we imported the first group of queen honey bees from Russia for study (*ABJ* 137: 787-789). Subsequent field tests compared mite growth in Russian and domestic colonies of bees when placed side-by-side at the same locations. Many colonies of Russian bees showed significant resistance to varroa mites in those tests (*ABJ* 139: 287-290). Various lines of Russian queens were produced from imported queens, and those lines were challenged in field trials in Iowa, Louisiana and Mississippi to select those having maximal varroa resistance (*ABJ* 141: 658-661), honey production (*ABJ* 141: 726-729), and resistance to tracheal mites (*ABJ* 141: 810-812). Our breeding program has the following basic scheme:

(**a**) queens screened in Russia for varroa resistance

(**b**) importation and quarantine of queens on a barrier island off the coast of Louisiana

(**c**) official release of imported queens and their progeny from quarantine by USDA-APHIS

(**d**) initial field selection to identify the most resistant queens from an imported group

(**e**) intensive field selection for honey production and resistance to varroa and tracheal mites for daughter queens raised from the best imported queens (multi-state field trials)

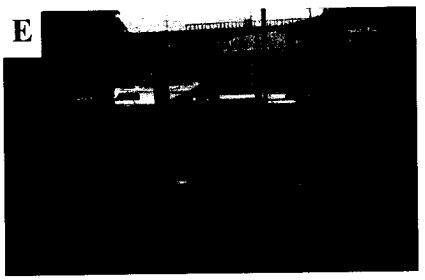
(**f**) the production of breeder queens for use by commercial interests; a round-robin or rotating mating design is used to continually improve varroa-resistance while avoiding inbreeding (*ABJ* 140: 305-307)

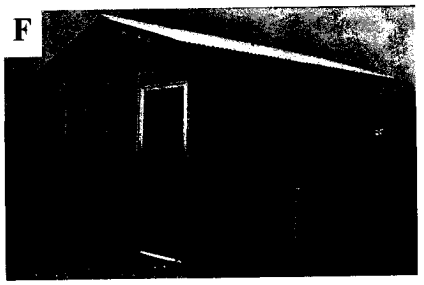
Past reports of this research program have focused primarily on steps **e** This paper will concentrate on **b** and describe the general quarantine procedures and the methods that were used to select the best imported Russian queens from the 1999 and 2000 shipments for subsequent field selection in multi-state field trials.

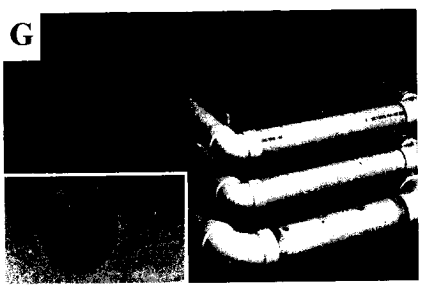
Quarantine Procedures

The USDA-ARS Honey Bee Quarantine Station (Fig. 1) is a secure fenced-in area (40' x 60') on Grand T Island, a barrier island which is located across Barataria Pass about 0.5 miles of the eastern shore of Grand Isle, LA (Fig. 2). The site is located near the Lyle S. St. Amant Marine Laboratory, which belongs to the Louisiana Department of Wildlife & Fisheries. Officials from USDA-APHIS, LDAF, and staff members from our laboratory inspect the colonies for diseases or abnormal conditions periodically throughout a 4 to 6-month quarantine period. Imported queens, their colonies, and hive equipment will be destroyed if any severe known or unknown disease is discovered.

Bees brought to the United States are taken directly to established colonies of bees that have been prepared to receive queens. We split existing source colonies from Baton Rouge to produce equal-sized colonies. The colonies are kept within the quarantine site that is bordered by a







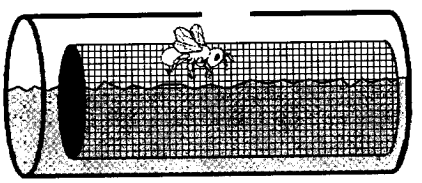


Figure 1 - The USDA-ARS Quarantine Station located on Grand Terre island, LA. A. Entrance gates are locked at all times except during inspection and maintenance visits. B. View of the entire 40' x 60' compound and the surrounding 8 ' fence before any trees had grown (1997). C. View of the compound after trees had grown, providing some shade for colonies (2000). D. Lawn mowing is part of the weekly inspection r tine. E. Pier leading to the front gate of the compound from a boat channel that cuts through the island. F Screened hut used for grafting and artificial insemination procedur G. Reservoir that provides bees a source of fresh water needed for drinking and cooling of the colonies during the hot summer months. The reservoir consists of three rectangular sections formed by connecting PVC pipes (left). Each pipe has a series of ¾" holes drilled in the top to give bees access to the water (middle), and cylindrical pieces of hardware cloth line the entire length of all pipes (right) to give the bees a surface to grasp as they drink, which keeps them from drowning.

cyclone fence (8 feet tall; Fig 1B) with locked gates. Although the Quarantine Station is easily accessible by a road and then a short boat trip to the neighboring Grand Isle, the physical security of the bee colonies is assured by being reasonably remote and by being monitored by staff from the LDWF who live near the station. Additionally, the St. Amant Marine Laboratory has all the facilities necessary to support data collection and 24 hour supervision of the colonies.

The Quarantine Station is separated from the closest honey bee population by 31 km of open water and salt-grass estuary (Fig. 2). Although worker bees and drones can fly up to 3-5 km over water, the area around the site is a natural bee-free zone. The salt marshes and bays offer no natural cavities for nesting bees. The lack of fresh water limits intrusion of feral bees from areas where some honey bees do occur (Leeville - Golden Meadow area). If escapees followed LA highway 1 (a strip of artificial "high ground" through the otherwise flooded estuary), they would have to travel 45 km before they reached a zone having bee forage sufficient to support year round colony survival. Risks are practically non-existent that escapees would contribute to the germplasm of the mainland bee population.

Queens to be exported to the United States are examined for parasitic mites before being caged with 5-8 attendant worker bees. The attendant bees are also examined for mites before being caged. During transit, each cage is supplied with queen candy and a queen tab, which is a small strip of miticide-impregnated plastic designed to kill varroa mites. The queen candy cannot contain honey because it may harbor spores of the American foulbrood bacterium. All queens are bundled together and carried by USDA personnel or by the cooperating scientist from the participating foreign country. Immediately upon arrival in Louisiana (airport in either New Orleans or Baton Rouge), the queens are transported by USDA vehicles to Grand Isle (Fig 2) and then by boat to Grand Terre Island for installation into quarantine colonies. All shipping cages are destroyed by burning.

Each queen is anesthetized with carbon dioxide and microscopically examined for external parasitic mites by inspectors from USDA-APHIS and LDAF before placement into a colony. The attendant worker bees are killed by being frozen in liquid nitrogen. These bees are transported to Baton Rouge where they are microscopically examined for varroa mites, external *Acarapis* mites and tracheal mites. A subsample of the attendant bees from each queen is sent to the USDA-ARS Beneficial Insects Laboratory, Beltsville, Maryland. The primary responsibility for disease and pest inspection rests with honey bee pathologists from this laboratory. Subsequent inspections by LDAF occur at least once a month during the quarantine period for any set of imported queens, and personnel from our laboratory inspect the queens on a weekly basis.

All queens are maintained in new hive equipment fitted with a queen excluder placed between the bottom board and the medium-depth brood chamber. Most queens are placed into single-story hives containing about 10,000 - 15,000 bees. More hive bodies are added as the bee populations grow. The wings of all imported queens and their daughter queens are clipped to prevent any accidental escapes. All colonies have miticide strips to control varroa mites throughout the quarantine period.

The cover, hive bodies and bottom board of each unit are securely fastened with a strap (Fig 3). This precaution prevents hive components and bees from being blown during high winds that accompany afternoon thunder showers or

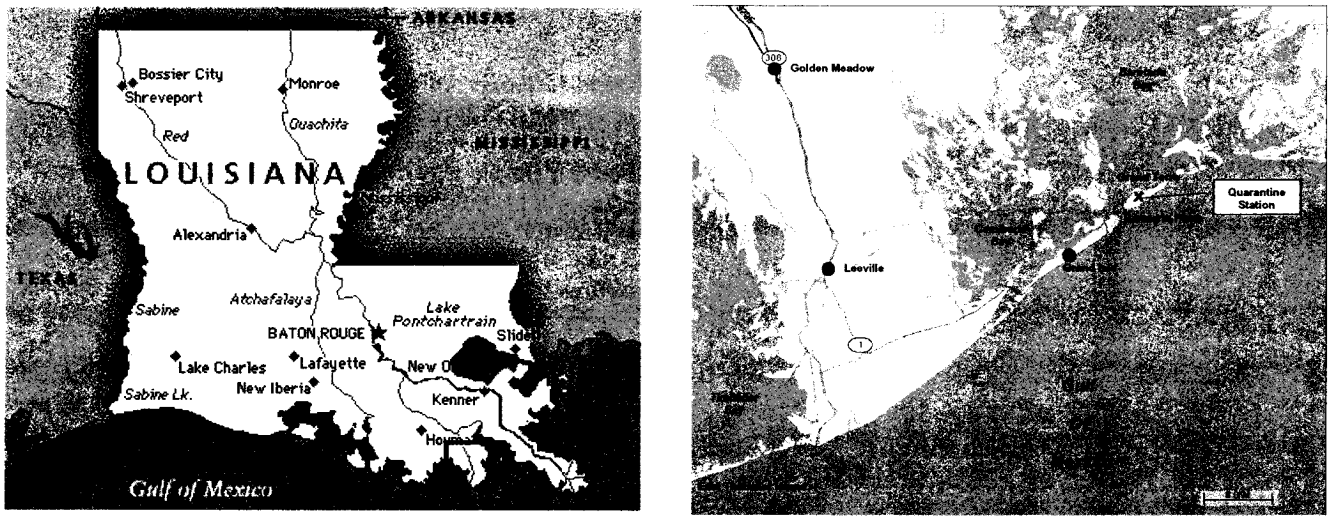
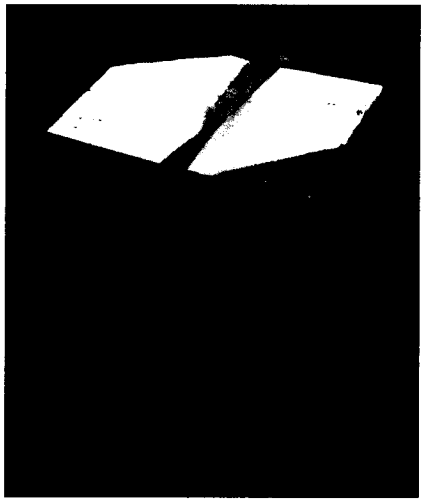


Figure 2 - Maps showing the location of the Quarantine Station (X) on Grand Terre island, LA. The rectangle on the state map shows the area of the state that is represented by the exploded view in the larger map. Although Grand Terre Island lies within bee flight range of Grand Isle, the entire area below and east of Golden Meadow is a natural barrier consisting mostly of salt marsh estuaries that do not support a feral bee population. Hence, bee swarms that may be accidentally released from the Quarantine Station are not likely to survive and integrate with feral honey bees on the mainland.

tropical storms and hurricanes. Each lid is fitted with a Styrofoam® board placed about 2 inches above the lid to offer some shade as protection from intense sunshine (Fig 3).

Only project personnel or persons supervised by them are permitted to handle the colonies. Staff members routinely inspect colonies every 7-10 days to (1) identify the development of diseases or pest populations, and (2) eliminate queen cells in each colony. Queen cells are cut to prevent the development of new virgin queens. Colonies are inspected in the early to mid-morning in order to limit the release of drones.

Figure 3 - A typical hive used to quarantine an imported queen bee. A moving strap secures the hive components so that they are not separated by strong winds during storms. The lid is shaded by ¾" thick Styrofoam board that is placed about 2 inches above the lid. A queen excluder is placed between the bottom board and the first hive body to prevent the queen from escaping.



Staff members see to the basic needs of the bees during the routine inspections. A 30-gallon water reservoir (Fig 1G) must be replenished every week so that the bees have access to fresh water for hydration and nest cooling. The reservoir consists of three separate troughs that are stacked vertically. Each trough is formed by connecting four long PVC pipes (3-4" diameter) to form an enclosed rectangular cavity. Holes having ¾ inch diameter are drilled along the upper surface of each trough to permit bees to enter and gather water. A cylindrical roll of ¼" wire mesh is inserted throughout the length of each trough to prevent the bees from drowning in the pipes (Fig. 1G). The fresh water is pumped to the quarantine site from a large rainwater cistern maintained by personnel from the St. Amant Marine Laboratory. Each colony is fed sugar syrup and pollen during times of dearth.

Any beekeeping equipment or other equipment that contacts bees must remain at the Quarantine Station until the quarantine period has ended. Delicate instruments like microscopes and insemination devices are kept within the St. Amant Marine Laboratory to protect them from weather. When given permission from USDA-APHIS to do so, back-up queens are produced and artificially inseminated on the island during the quarantine period. This is especially important when the shipment contains less than 30 queens. The back-up queens are stored in queen bank colonies after being inseminated, and they are used to replace any queens that die during the quarantine period. Grafting and artificial inseminations are performed within a screened hut (Fig 1F).

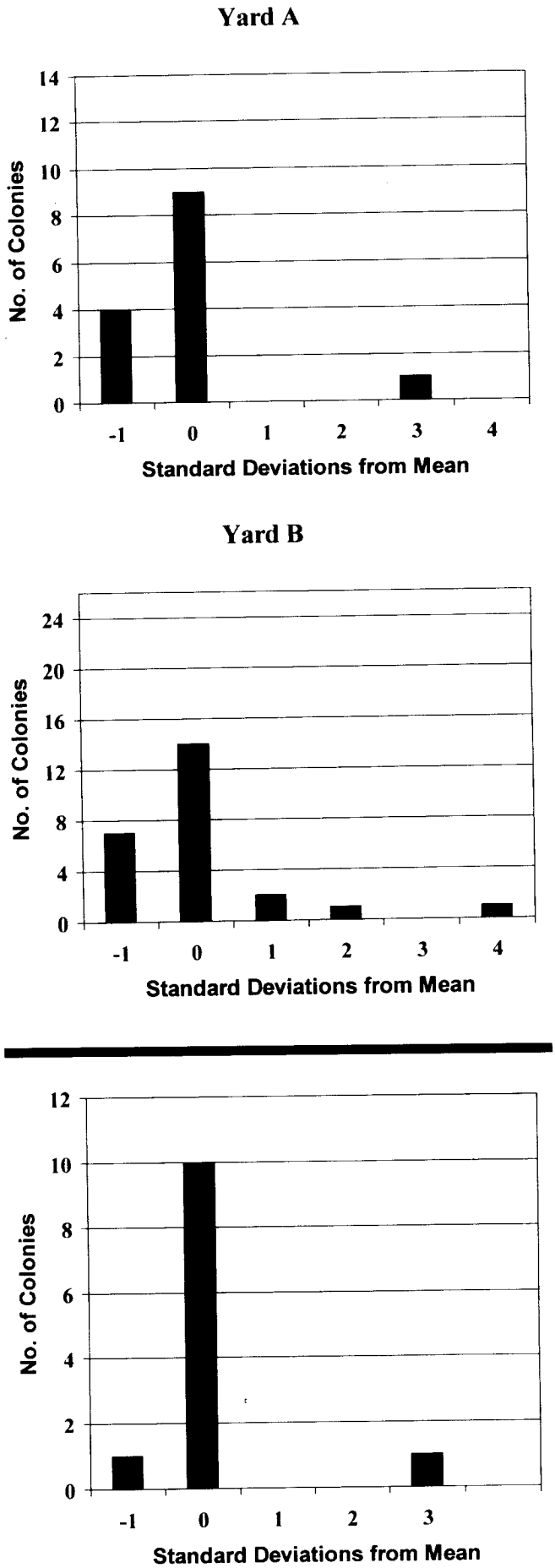
Officials from USDA-APHIS may release a group of imported queens from quarantine after a period of 4 to 6 months if reports by inspecting officials from LDAF and our laboratory indicate that no health risks exist. Any disease condition or parasites are reported immediately to USDA-APHIS and LDAF, and the entire apiary must be destroyed by fire when ordered by USDA-APHIS. This protective measure has never been used at the site because no threatening conditions have yet been discovered.

Field Selection of Imported Queens

1999 Shipment

During June 9-13, Bob Danka and José Villa from our laboratory collected 100 queen bees from 14 cooperating beekeepers living near Vladivostok, Russia. The scientists returned with 97 live queens. These queens were installed into single-story colonies within the Quarantine Station on June 17. All colonies were given two Apistan™ strips throughout the quarantine period. Colonies were released from quarantine in mid-October. Sixty imported queens survived the quarantine period. They were moved within their colonies to two locations (20 and 40 colonies, respectively) near our laboratory in Baton Rouge, LA. Colonies had grown to fill 2-3 medium-depth hive bodies when released from quarantine.

We inoculated each colony with varroa mites in the fall of 1999 so that mite growth could be monitored during the spring of 2000. Each colony was given 1-2 capped brood combs from a varroa-infected source colony. Twenty-five dif source colonies were used, and all source



and field-tested in 2000. The variable mite growth (see Table 1) was standardized for colonies in each of two apiaries by using the z-transformation. This statistical method is a simple way of comparing units that come fr different populations by converting each population to a normal distribution having a mean of 0 and a standard deviation of 1. The top figure represents the distribution of z-scores for the 14 colonies in apiary A, and the bottom represents the 26 colonies in apiary B. Varroa resistance is defined as colonies having the lowest mite growth. Low mite growth translates into low z-scores, and the most resistant colonies have negative z-scores. Four queens from apiary A and 7 queens from apiary B had z-scor that were at least -1. These queens were selected as br ers for lines of queens that underwent further selection for varroa resistance in multi-state field trials in 2001.

colonies had commercial, non-Russian queens. Each inoculating comb averaged 10-15 mites per 100 worker cells (no drone brood) and between 80-150 square inches of capped worker brood area (both sides combined). Combs were divided among colonies in an attempt to inoculate each with 400-500 varroa mites.

Initial mite populations were estimated in mid-January by washing a sample of about 150 grams of adult bees from each colony Colonies were sampled when they had no brood; therefore, all mites in a colony were living on adult bees. The numbers of bees and mites were counted in each sample to determine the infestation rate (mites per bee). The number of frames of bees was estimated visually to determine approximate adult bee populations (# frames of bees 1,570 bees per frame). The initial mite populations were estimated by multiplying the infestation rate times the total number of bees in the colony. The 60 colonies averaged about 300 mites and 10,000 bees at the start of the test.

Twenty of the 60 queens either died or were superseded during the 5-month test. Although naturally-mated supersedure queens could be used as drone sources in breeding and propagation, our selection efforts focused only on the remaining 40 original imported queens. Final mite and bee populations were determined in June. The final mite population was determined by estimating the number of mites on adult bees and in capped brood for each colony. The total number of mites on adult bees was found using the same method used for the initial mite population (previous paragraph). The infestation levels of mites in capped brood cells (foundress mites per brood cell) was determined by examining 200 worker cells and 100 drone cells from two combs for each colony. The total number of frames of capped worker and drone brood was visually estimated to determine the total numbers of capped worker brood cells (# full

Figure 5 - Plot showing how breeder queens were selected from a pool of Russian queens that were imported in 2000 and field-tested in 2001 (see Fig 4 for details on the plot method). Mite growth from these colonies (Table 2) was much lower than seen in the previous group of imported queens (Table 1). This reduced mite growth may not indicate that the 2000 imports were more varroa-resistant than the 1999 imports because mite growth was also low in a few commercial colonies that were also tested with the 2000 imports (see Table 2). It is more likely that other factors (environmental, etc.) caused the low growth of mites during this field test. Only 1 colony had a z-score of -1, but 10 colonies had z-scores near 0 (and some of these wer negative scores). The 5 colonies with the lowest z-scor will be used as breeder queens to produce lines of queens that will participate in further selection for varroa-r ance in a multi-state field trial to begin in the spring 2002.

Variable	Apiary A (14 colonies)	Apiary B (26 colonies)
Initial mite population (January)	273 ± 85	254 ± 70
Final mite population (June)	3,389 ± 1,449	3,965 ± 2,824
Mite growth = (final / initial)	13.3 ± 7.0	16.4 ± 11.7
Initial bee population (January)	9,690 ± 1,839	12,568 ± 1,897
Final bee population (June)	13,404 ± 7,613	20, 410 ± 5,328
Bee growth = (final/initial)	1.3 ± 0.6	1.6 ± 0.4
Worker brood, square inches (June)	238 ± 215	436 ± 150

Table 1 - Summary of changes in mite and bee populations (mean ± SD) during a field test for varroa resistance in colonies with queens imported from Russia in June 1999. Colonies were inoculated with varroa mites by transferring capped brood combs from varroa-infected colonies in September 1999. Mite and bee populations were monitored during a 5-month period in the spring of 2000. Only the 11 best colonies (those with the lowest mite growth, see Fig 4) were retained as sources of queens that underwent more field selection in multi-state field trials.

Variable	Russian (12 colonies)	commercial (5 colonies)
Initial mite population (May)	109 ± 21	128 ± 25
Final mite population (September)	318 ± 291	672 ± 224
Mite growth = (final / initial)	3.2 ± 3.6	5.3 ± 1.8
Initial bee population (May)	7.550 ± 324	7,233 ± 124
Final bee population (September)	21,855 ± 5,667	25, 947 ± 6,547
Bee growth = (final/initial)	2.9 ± 0.8	3.6 ± 0.9
Worker brood, square inches (September)	306 ± 81	463 ± 133
Drone brood, square inches (September)	17 ± 35	6 ± 9

Table 2 - Summary of changes in mite and bee populations (mean ± SD) during a field test of varroa resistance for queens imported from Russia in 2000. The scr ing began when 28 colonies were formed from package bees in mid-May 2001. All colonies had similar populations of bees and mites at the beginning. Each colony started with a test queen (21 Russian and 7 commer queens), and bee and mite populations were measur after 4 months of growth. Only 17 colonies were included in the table because 3 queens died and 8 colonies had chronic problems with either chalkbrood or low worker brood production throughout the test. The best 5 Russian colonies were chosen as breeder queens (see Fig. 5). Their daughter queens will undergo further field selection in 2002.

frames of worker brood x 4,350 worker cells per frame) and capped drone brood cells (# full frames of drone brood x 2,784 drone cells per frame). The total number of mites in brood was calculated by multiplying the infestation rate by the total number of cells for each type of brood cell.

All colonies were about the same size when released from quarantine in September 1999, but colonies from the two apiaries differed significantly in adult bee populations throughout the test in 2000 (Table 1). Our major selection variable was mite population growth, defined as the final mite population divided by the initial mite population. We chose those colonies with the lowest mite population growth from the two apiaries to be breeder queens. Because growth of mites was slightly different between the two apiaries (Table 1), the variable mite growth for each apiary was standardized to a mean of 0 and a standard deviation of 1 using the z-transformation (Fig 4). The z-score for each colony was calculated with the following equation:

Z = [(mite growth for a colony) - (average mite growth for all colonies in the apiary)] ÷ (the standard deviation for all colonies in the apiary).

Colonies with the lowest z-scores were selected as breeder queens. A negative z-score indicates that mite growth was lower than the arithmetic average for the entire group of colonies in a particular apiary. Four queens from apiary A and seven from apiary B were selected as potential breeder queens because their z-scores were < 0 (Fig 4).

During early spring 2001, hundreds of daughter queens were raised from 5 of the 11 potential breeder queens. These daughter queens were mated to Russian drones in isolation on another Louisiana barrier island (Marsh Island). The drones used in the matings were produced from the most varroa resistant queens selected from a group that were imported from Russia in 1997. The queens from these 5 lines of Russian bees underwent intensive field selection for (a) honey production, (b) resistance to varroa mites, (c) resistance to tracheal mites and (d) low defense behavior in a multi-state field trial during 2001 (*ABJ* 141: 658-661, 726-729 and 810-812). Three of these lines performed well for all variables, and they were released as breeder queens for commercial use beginning February 2002. The other two field-tested lines will be retained by our breeding program, and after further selection, may be released later. The remaining 6 lines of breeder queens that were not field-tested in 2001 will be tested in similar field trails during 2002.

2000 Shipment

Dr. Victor Kuznetsov, a cooperating scientist from the Russian Academy of Sciences, carried 20 queens from Vladivostok, Russia to the United States on July 12, 2000. All queens were installed into colonies on Grand Terre Island during the following day. Colonies were given two coumaphos strips throughout quarantine. Colonies were released from quarantine in December and transported to Baton Rouge in early January 2001.

Only 11 of 20 imported queens survived the quarantine period. However, another 40-50 back-up queens had been produced and banked on the island during the quarantine period. Daughters from all 20 original queens were included in the group of back-up queens. All back-ups were artificially inseminated with semen from drones randomly collected from the quarantined colonies. The 11 surviving imported queens were placed in an apiary with 25 other colonies near our laboratory in Baton Rouge. Queens from these additional colonies were removed and replaced with one of the back-up queens. Queen cells were cut and basic beekeeping tasks were performed every 7-10 days for all 36 colonies through May 2001.

The field selection for varroa-resistance in some queens began when a lar package of bees was subdivided into smaller packages that were re-combined to form 28 equal-sized colonies (described in *ABJ* 141: 785-786). On May 9, we collected 70 pounds of varroa-infested bees from 20 source colonies that contained non-Russian commercial queens. The lar package of bees was held overnight in a cold room with constant temperature of 55°F. The bees were fed sugar syrup and water using gravity feeders. The lar package was subdivided by scooping about 500 grams of bees into each of 56 pre-weighed and numbered packages on the nest day. The packages were re-weighed after filling to determine the weight of bees, and packages were paired to give maximum uniformity of bee weight for each colony.

The 28 colonies were established in deep hive bodies at an isolated apiary in Baton Rouge on May 10. Each colony

and a caged test queen (queens were removed from their colonies an hour before setting up the new test colonies). Eleven queens were the surviving original Russian imports, 10 were artificially inseminated back-up Russian queens, and 7 were non-Russian commercial queens. Eighteen of the imported queen lines were represented in the group of 21 Russian test queens. Bees were released from the packages, but the colony entrances remained screened until the following night after sunset. Each queen was released from her cage on May 12. The 28 colonies averaged 943 ± 30 grams (mean ± SD) of bees after this initial assembly.

We estimated initial mite populations for the test colonies by washing mites from a subsample of bees taken from each colony. A sample of bees was scooped from each colony on May 18, which was 6 days after releasing queens and before mites began to invade brood cells to reproduce. Each sample was weighed before being washed with ethanol and drained through a sieve to separate varroa mites from the worker bees. Mites were counted to give the infestation rate (mites per gram of bee). After removal of the samples, each colony began the test with approximately 849 grams of bees and 116 varroa mites.

Final mite and bee populations were determined during September, 4 months after release of the test queens. The final mite population for each colony was determined by summing the number of mites on adult bees and in capped brood. The total weight of bees (kg of bees) in each colony was determined by weighing the hives with and without bees. The infestation rate of mites on adult bees (mites per gram of bees) was determined by washing a weighed sample of *ca.* 130 grams of bees from each colony. Total mites on adult bees was calculated by multiplying the total weight of bees by the infestation rate (kg of bees x 1,000 grams per kg x mites per gram of bees). The total areas (square inches) of capped worker and drone brood was measured using a 1"×1" wire grid. Brood areas were converted to total numbers of capped worker (square inches of worker brood x 24 worker cells per square inch) and drone cells (square inches of drone brood x 16 drone cells per square inch). The infestation of mites in capped brood cells was obtained by opening 200 worker cells and 100 drone cells from two combs for each colony and counting the number of adult female mites. The total mites in capped brood was found by multiplying the total numbers of capped cells by the infestation rate for both types of brood cells.

Three queens died or were superseded during the test. Another 3 colonies had chronic problems with chalkbrood, and 5 colonies had small bee populations and worker brood areas less than 200 square inches at the end of the test. Therefore, and 5 commercial colonies (Table 2). As with the 1999 imports, the main selection criterion was low mite population growth. We chose the 5 Russian colonies having the lowest mite growth as breeder queens that will be used to produce lines of queens to be field-tested next year. Only 1 colony had a z-score of -1, but 10 colonies had scores near 0, which is the average mite growth for the entire group of queens (Fig 5). Although only the best 5 of these 11 queens will be used as breeders in 2002, the other 6 queens will be retained and daughter queens will be propagated and reserved for future field trials. Daughter queens from the best 5 breeders will be produced and naturally mated in isolation with selected Russian drones on an island during the spring of 2002. Several hundred of these queens will undergo further selection for resistance to varroa and tracheal mites, honey production, and low defense behavior in multi-state field trials during the bee season of 2002. The best lines of queens from these trials will be released to commercial beekeepers in the spring of 2003.

The overall mite growth was much lower in the 2000 imports than in the 1999 imports (compare this variable between Tables 1 and 2). Reasons for reduced mite growth are not clear, but they probably do not reflect a greater varroa-resistance in the 2000 imports because mite growth was also low in the control colonies (Table 2). This same line of control queens provided an 8- to 10-fold increase in mite growth during a 4-month field test that was conducted concurrently at another location 200 miles away. Perhaps environmental factors (e.g. heavy rainfall totals associated with tropical storm Allison in June 2000) reduced mite growth in Baton Rouge.

Future Importations of Queens

Another 32 Russian queens that were imported in 2001 were released from quarantine in March 2002. As with the previous imports, these queens will be challenged with mites, and the most varroa resistant ones will be used to produce lines of queens that will undergo subsequent selection for important economic characteristics and varroa resistance in multi-state trials in 2003. We will also receive another importation of 30-50 Russian queens during June or July 2002.

Research programs are subject to change as needs and threats of the beekeeping industry change. Selective breeding is likely to be useful in solving new problems faced by our industry. The potential need for importing different varieties of honey bees having important genetic characteristics will likely remain in the near and distant future. Therefore, the USDA-ARS Honey Bee Quarantine Station will continue to be an important facility to be used by our laboratory and

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