

The Saskatraz Hybrid Project 2015

Albert J. Robertson¹, Antonio Munoz¹, Tom Robertson¹, Neil Morrison¹, Colton Rutherford¹, Yang Tan¹, David Powell² and Ray Olivarez².

¹*Meadow Ridge Enterprise Ltd., Saskatoon, SK S7K 3J9, Canada*

²*Orland, CA 95963, USA*

Corresponding author, Albert J. Robertson: Email: a.j.robertson@sasktel.net; cell 306 270 6627; website www.saskatraz.com

Introduction

An important part of any breeding program is the commercialization and distribution of the breeding stock to the end users. A long-term objective of the Saskatraz project (www.saskatraz.com) is to produce Saskatraz production queens in adequate numbers, at reasonable prices, for commercial beekeepers, in the spring of the year. Since the Saskatchewan climate is not suitable for the production of large numbers of queens in a timely fashion attempts were made to have queens from Saskatraz breeders produced in Chile, Australia and Northern California. We succeeded in establishing commercial queen production capabilities in Orland, California in 2012-2013 with David Powell and Ray Olivarez, two large-scale queen producers who both ship to Canada.

Methods and Materials

Every year colonies are selected for honey production, overwintering ability, temperament, mite resistance and brood diseases. Selections are made yearly from at least 1500 colonies at Meadow Ridge apiaries. In addition, selections contributed (exchange of queen cells, etc.) by other Saskatchewan beekeepers are also evaluated. Some of the selected colonies are placed in natural selection apiaries to test for mite resistance (recurrent natural selection), and others are placed in separate apiaries to evaluate honey production and other traits. Breeder queens are selected after two to three year evaluations and virgin queens from selected breeders are crossed (close population mated) at natural selection apiaries to improve varroa tolerance, and at apiaries with selections for high honey production to maintain productivity. In the last few years we have set up a natural selection apiary with colonies bred for high VSH activity, and in 2015 an apiary with colonies selected to produce diverse drones from colonies selected for economic traits (honey production, wintering ability, and varroa tolerance) from 7 different Saskatraz families. This should maintain genetic diversity as well as enriching for alleles carrying beneficial traits.

Saskatraz queens mated at these apiaries undergo preliminary evaluation (brood pattern, temperament, etc.), and are sent to Orland California in late September of each year. The progeny from these queens are screened for viruses (DWV, IAPV, and KBV) and

microsporidia (*nosema Apis* and *Ceranae*). This information is used to make final selections in California. In 2015 we sent 120 queens to be reselected in March 2016. They are established in colonies after dequeening resident California queens. Colonies are treated for varroa about 30 days before introducing Saskatraz queens. Treatments in 2015 were in August with Apivar strips.

Over the last few years the California Tech Transfer Team, Bee Informed Partnership has independently evaluated our Saskatraz breeding stock in late February or early March. The evaluation included hygienic testing (uncapped, removed), colony strength (frames of brood), brood pattern (1-poor to 5-best), queen status, temperament (1- best to 5-poor), colour, varroa infestation (Mites per Hundred Bees) and nosema spore count (Figure 1).

In mid-March, Albert Robertson does the final colony evaluations and selects 10 to 20 of the best queens to graft from. Final selections include evaluations for colony strength, phoretic varroa, varroa in drone and worker brood, brood pattern, brood diseases (chalkbrood etc.), and temperament (Table 1). Saskatraz hybrids are produced from these breeders to distribute to Canadian beekeepers.

Results

Table 1. Fifteen colonies were selected from 50 to multiply for Saskatraz hybrids, they were scored for brood pattern, chalkbrood, temperament, pollen placement, queen status, queen mark, phoretic mite infestation (MPH), percent brood infestation (worker and drone), and hygienic behavior (freeze test). General observations are noted. Temperament score gentle 1 to aggressive 10. ‘*’ indicates queen mark (paint) partially or completely removed.

Colony Number	Colony ID	Brood Pattern	Chalkbrood Presence (+/-)	Temperament	Pollen Placement	Queen Presence (+/-)	Queen Mark Presence (+/-)	Phoretic Mite Infestation (MHB)	%Mite Infestation in Worker Brood	%Mite Infestation in Drone Brood	Hygienic Behaviour Test	Observations
3	S65 SW 09 Merv 14	Good	-	1	Good	+	-*	0	0	0	87%O/ 82%R	Dark drone; none superseding cells
7	S65 Robin 14	Excellent	-	1	Average	+	+	0	0	0	93%O/ 80%R	Green mark on queen
9	S28 Priddy 14	Excellent	-	1	Average	+	-*	0	0	0	-	Good population; no brood disease
11	S28 Martin 14	Average	-	1	Average	+	+	0	0	0	98%O/ 67%R	-

12	S28 Martin 14	Average	-	1	Average	+	-*	0	0	0	71%O/ 53%R	Queen clipped wings; dark queen
16	S146-GP Robins	Good	-	1	Good	+	-	0	0	0	88%O/ 85%R	Yellow queen, dark tip
24	Y26 x 26 Martin 14	Good	-	1	Average	+	-	0	0	-	99%O/ 99%R	No drone brood; no visible mark on queen
25	Y26 x 26 Martin 14	Excellent	-	1	Average	+	+	0	0	0	100%O/ 100%R	-
36	G44 JHN 12-9 Bainsville e 14	Excellent	-	1	Average	+	+	0	0	0	68%O/ 60%R	Green Mark
37	G44 JHN 12-9 Bainsville e 14	Excellent	-	1	Average	+	+	0	0	-	93%O/ 75%R	No Drone
45	S96 Ricardo 14	Excellent	-	1	Average	-	-	0	0	0	89%O/ 70%R	Did not find queen
46	S96-14	Good	-	1	Good	+	+	0	0	-	-	Healthy Brood; bees calm on frame; green mark on queen
47	S96 Cheers 14	Average	-	1	Average	+	-	0	0	0	94%O/ 65%R	Dark queen
50	S96 Priddy 14	Excellent	-	3	Average	+	+	0	0	0	-	Stung once; excellent hive
	S14 at Davids	Average	-	1	Average	+	+	10	1.6	8.5	-	From last year, no treatment; red mark

Figure 1. Data from Northern California Tech-Transfer team on Saskatraz breeder queens. A) The e-mail from Northern California Tech-Transfer team. B) Results of hygienic tests on Saskatraz breeder queens; colonies with good hygienic test results were highlighted. A)

From: Benjamin Sallmann [mailto:bensallmann@gmail.com]
Sent: Wednesday, March 04, 2015 7:49 PM
To: Ray Olivarez; Jose Gomez; rob snyder
Subject: SP Hygienic Results

Hi Ray and Jose,

here are the results of the hygienic tests we finished today at Handerly Hill. There were a number of colonies that scored at or near 100%. The rest of the information, including varroa and nosema data, will be sent as soon as it is processed. Please let us know if you have any questions.

Thank you,

The Bee Team

Colony #	Queen Information	Uncapped and removed	Removed
1467	24-Y26 x 26 Martins 14	99%	99%
1468	25- Y26 x 26 Martins 14	100%	100%
1469	12-S28 Martins 14	71%	53%
1470	13-S28 Martins 14	88%	82%
1471	18-S146 GP-09 Mervs 14	52%	42%
1472	21 G11-3 Priddy's 14	76%	63%
1473	34-B50 23A1-12 Martins 14	63%	51%

1474	11-S28 Martins 14	98%	67%
1475	41- S96 RC13 S. Bob 14	64%	56%
1477	45- S96 RC 13 Ricardos 14	89%	70%
1478	16-S146-GP Robins 14	88%	85%
1479	3-S65 SW-09 Mervs 14	87%	82%
1480	7-S65 Robins 14	93%	80%
1481	28- Y26 x26 Cheers 14	66%	54%
1482	8-S28 Priddy's 14	79%	76%
1484	44- S96 RC13Ricardos 14	58%	50%
1485	43- S96 RC 13 Ricardos 14	89%	74%
1483	19- G11-3 Priddy's 14	100%	99%

--

Benjamin Sallmann

Bee Informed Partnership

Northern California Tech-Transfer Team

2279-B Del Oro Ave., Oroville, CA 95965

B)

Collection Date: 2015 February 19th

Colony Type: Breeder

Colony ID	Hive Body	Frames of Bees	Brood Pattern	Queen Status	Temperament	Color	Mites Per Hundred Bees	Millions of Spores/Bees	%Uncapping+ Removing	%Removed
1469	1D	6.5	4.5	QR	1	3.75	0	0.25	71%	53%
1470	1D	7.5	4.5	QS	1	3.5	0	0.3	88%	82%
1471	1D	7	4.25	QR	1	3.25	0	0.3	52%	42%
1472	1D	7	5	QR	1	3.75	0	0.15	76%	63%
1473	1D	5	4.5	QS	1	3.25	0	2.2	63%	51%
1474	1D	3.5	4.5	QR	1	3.5	0	0.35	98%	67%
1475	1D	5.5	5	QR	1	3.5	0	2	64%	56%
1477	1D	7.5	5	QR	1	3.5	0	0.9	89%	70%
1478	1D	7	4.5	QR	1	3.25	0	0.65	88%	85%
1479	1D	6.5	5	QR	1	3	0	0.6	87%	82%
1480	1D	8	5	QR	1	3.75	0	0.05	93%	80%
1481	1D	6.5	4.75	QR	1	3.75	0	0.4	66%	54%
1482	1D	7	4.75	QS	1	3.75	0	2.25	79%	76%
1483	1D	7	5	QR	1	4	0	0.35	100%	99%
1484	1D	7	4.75	QR	1	3.5	0	2.75	58%	50%
1485	1D	3	5	QS	1	3.75	0	0.95	89%	74%

Figure 2. Photos of selected breeder queens, progeny and their brood patterns.

A) S65 Robins -14 (Hygienic Behavior; 93%U+80%R)



B) S96 RCD-14 (Hygienic Behavior; 89%U+70%R)



C) S96 PRD-14 (Hygienic Behavior; 89%U+74%R)



D) Y26x26 Martins (Hygienic Behavior; 100%U+100%R)



Figure 3. Photos of the selected breeder queens (red arrows pointed at). The breeder queens are #3-S65 SW 09 (A), #7-S65 ROB 14 (B), #9-S28 PRD 14 (C), #11-S28 MRT 14 (D), #12-S28 MRT 14 (E), #16-S146 GP (F), #24-Y26x26 MRT 14 (G), #25-Y26 x 26 MRT 14 (H), #37-G44 JHN 12-9 (I), #46-S96-14 (J), #47-S96 CHR 14 (K) and #50-S96 PRD 14 (L).





Figures 2 and 3 show photos of the selected breeder queens, their worker progeny, brood pattern and queen retinue.

Discussion

The Saskatraz hybrid production queens produced in California have the following characteristics. The virgin queens have 100% Saskatraz ancestry since they are produced from Saskatraz breeder queens. They will produce 100% Canadian Saskatraz drones, because the drones are produced by the queens' germ cells after meiosis. They are haploid and are not fertilized by the queen prior to laying female workers eggs. All of the drones have Canadian Saskatraz grandfathers. Drones have no father just grandfather's. This makes the Saskatraz hybrids valuable for any breeding program, and allows queen breeders to re-construct near pure Saskatraz family phenotypes. This can be achieved by backcrossing virgin queens from Saskatraz breeder queens to apiaries composed of the hybrid stock.

The hybrid stock will be available from May 1 until July or later. Establishment of the hybrid queens the first 3 weeks in May in 4 to 5 frame nucs, with some brood will give you strong colonies going into the honey flow. Supplying some drone comb should give you fertile drones in 5 to 6 weeks. Since the Canadian queens have mated with California drone populations, they will be carrying sacs of semen from these drones. Their female worker bees will be fertilized with this drone semen so the workers will be hybrid. Since the California drone populations are not closely related, or somewhat divergent from the Saskatraz stock we can expect some increased vigor in the hybrid worker population. We do not recommend grafting from any of the hybrid queens, no matter how good their performance. The best use of these hybrid colonies for breeding purposes will be for the production of drones.

Summary

We are optimistic about this project and have been providing Saskatraz hybrid queens for competitive prices. Meadow Ridge purchases the queens from collaborating queen producers, imports and distributes Saskatraz hybrid queens to Canadian beekeepers. These queens are costing \$5 to \$6 more to produce than generic queens, and Meadow Ridge is supplying the breeders, disease testing services and making final selections in California. We feel this is an economical way to disseminate the genetics we have developed to commercial beekeepers. It will also help us to continue our Saskatraz breeding program, since all stock sales revenues (royalties) go towards and are required for maintaining the Saskatraz breeding program.

Acknowledgements.

We thank all collaborating (Saskatchewan, Manitoba, Alberta) beekeepers and the California Bee Alert team for assistance in colony evaluations. Financial assistance by Meadow Ridge Enterprises LTD and virus and microsporidia disease testing at VIDO, U. of S. by ADF grant 20130110 to Meadow Ridge Enterprises LTD is gratefully acknowledged. A review of the Saskatraz breeding program and current publications can be found at www.saskatraz.com