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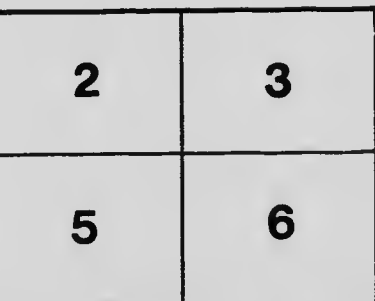
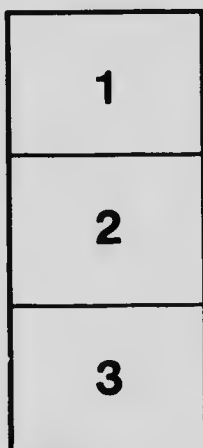
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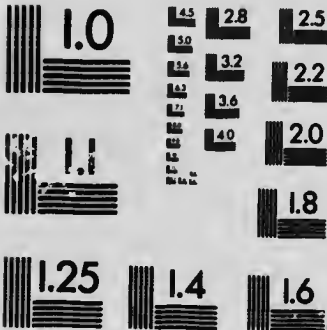
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SOME RESULTS
OF
CO-OPERATIVE EXPERIMENTS
ON
RACES OF BEES
TO DETERMINE THEIR POWER TO RESIST
EUROPEAN FOUL BROOD

BY
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(PRINTED BY AUTHORITY OF THE MINISTER OF AGRICULTURE)



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SOME RESULTS
OF
Co-operative Experiments on Races of Bees
TO DETERMINE THEIR POWER TO RESIST
European Foul Brood.

MORLEY PETTIT, PROVINCIAL APIARIST, GUELPH.

In combating the disease of bees known as European Foul Brood, the resisting power of the bees is an important factor. This power has been found to vary in different colonies and is generally considered to be a question of the race of bees, and probably the "strain" within the race. Common black bees are usually poor resisters, Italian bees are generally accepted as the best, and Carniolans are favored by some.

Since the year 1910, the writer has, under the auspices of the Ontario Agricultural and Experimental Union, been directing co-operative experiments, and has also corresponded and conversed with independent experimenters with a view to securing answers to the following questions:—

1. Are Carniolian bees as good resisters of European Foul Brood as Italians?
2. What strains of Italians, if any, are better resisters than others?
3. After this disease has been in a neighborhood a few years, is it more easily controlled?
4. Does it become less virulent or is a strain of better resisters developed?

The co-operative experimenters are beekeepers located in the European Foul Brood districts of Ontario. As the Ontario Agricultural College is not included in that district, experiments could not be conducted at the College apiary. The New York State Apiary Inspectors have also very kindly contributed results of their investigations dating back to 1897. The queens sent to experimenters from year to year are untested queens secured from well-known breeders whose bees are reported to be good resisters. The experimenter is left largely to his own devices as to the methods of test, being merely told to "introduce the queen to a good average colony that is affected with European Foul Brood. Sometimes there are colonies that seem to be immune to European Foul Brood for a while. Do not use these for experiment. If you have treated your bees by the shaking method introduce the queen to a good colony that was diseased before treating."

There is probably no better way of presenting the results of this investigation than to quote from letters received, then draw conclusions. As queens from only a few of the well-known breeders in America have been under observation the names of breeders are not published, but are designated by letters of the alphabet.

Perhaps the first important letter came from Chas. Stewart, Johnstown, N.Y., a State Apiary Inspector. He wrote Jan. 16, 1910: "Of all the races of bees the Italian resists disease the best, but we do not regard them as immune, although some strains are more nearly so than others. I would not say a man with Italian bees in a diseased locality would have no trouble, but that he would have less than others. When the disease breaks out in a new locality it is much harder to cure than after it has run for a time, when it yields to treatment more readily."

He wrote on Feb. 20, 1911, that he had one yard of bees which had not been affected, although the disease had passed all around him. He was rearing queens for sale from that yard, and we shall call his stock D.

On Feb. 18, 1911, N. D. West, Middleburg, N.Y., another State Apiary Inspector, wrote: "The very yellow strains of Italians do not seem to stand the disease like some of the three-banded race." On Mar. 16, 1911, in reference to Carniolans he wrote: "Capt. Hetherington thought well of them when he was alive. He thought they were good to resist European Foul Brood; but he had passed over the worst of European Foul Brood before he tried them. As I find them in my inspection work a good strain of pure Italians is better to resist European Foul Brood."

On Mar. 22, 1911, Wheeler D. Wright, of Altamont, N.Y., another New York State Inspector, wrote: "I have found by practical experience that the following strains of Italians resist the disease well, namely: A, B, C. My preference is the A stock."

In Oct. 1911, A. T. Brown, of Castleton, Durham County, Ont., wrote that a queen of the D stock proved to be a good layer, but failed to rid the colony of European Foul Brood. He continued by saying, "I have just one out of fifty colonies that kept clear of European Foul Brood, after one shaking, and made a nice lot of honey. *It was a black colony.*"

The following correspondence was received during the winter of 1912 and 1913:

"The Carniolan colony was not any better if as good as the blacks to resist European Foul Brood."—W. T. Kinsella, Cumberland, Russell County.

"In the latter part of the summer some disease cells developed in the Carniolan colony. She was the best colony I had for honey gathering so I was quite disappointed. The Italian queen I received from F has shown no signs of Foul Brood whatever, though not so good as the Carniolans for honey gathering she did good work."—Heeler M. Wood, Crookston, Hastings County.

"The Italian queen you had sent to me by F was received in fine shape. This year I got four natural swarms from it. All went in cellar in good shape. I examined them at least ten times and no signs of E. F. B., and I have five colonies from that queen."—Wm. Peck, Rt. No. 1, Murray, Prince Edward County.

"Our queen came from E. We introduced it on June 13th, 1911, into two colonies which had been treated for European Foul Brood. On June 21st, we found Foul Brood again, but a month later and also when we put them in the cellar we could find no trace of the disease. In 1912, we found several cells diseased, but they disappeared in a week or two afterwards. We have other colonies which made more honey, but few with finer combs of brood or less disease."—The Scott Sisters, Meyersburg, Northumberland County.

"I have learned more about bees in the past year than all I have learned in all the years I have kept bees. They have always paid me very well, but I knew very little of what their ability was to make money until you proposed to let me experiment in regard to the mastering of European Foul Brood. I think I have been most successful. I never saw a finer lot of bees than I have produced in one year, and I had plenty of European Foul Brood. I have none now, my hives are clean. All Italians are not proof against it, but I have some that are. Within two weeks after the queen you sent began to send out her brood there was no trace of Foul Brood. She filled the hive with brood, every card was filled up. This was in 1911. My bees came out fine in the spring of 1912, but it turned out to be one of the worst springs I ever saw. Three of

them dwindled down badly and a trace of E. R. B. could be seen. They made no honey as long as the Foul Brood was in the hive, but as soon as the bees increased, the Italians cleaned their hives. I can say that the best Italians are masters of E. F. B." He further states that his Italian bees of the A strain which was sent him for testing have completely mastered European Foul Brood although it was very bad in every one of his black colonies before he introduced them. The above letter was from J. B. Stone, Norham, Northumberland County.

The following extracts are taken from some letters received during the winter of 1914 and 1915, with reference to queens sent out for testing in 1913.

"I never had anything like the I strain of bees. They beat any black or hybrid bees I ever had. I consider them practically immune to E. F. B., prolific, non-swarming, gentle enough, good honey gatherers, cap comb honey all right. If I could have had such queens 25 years ago at \$10.00 each I would have been away ahead now. The G stock has proved to be absolutely worthless to me."—R. Lowey, Woodrows, Prince Edward County.

"The queen I received from J in 1913, was successfully introduced into a colony with European Foul Brood. They cleaned it out and were well prepared for winter. Wintered in fine condition, and did well as honey gatherers in 1914."—G. M. Hern, Niagara Falls, Lincoln County.

"The queen you sent me in 1913 from A was introduced and did well. I raised some nice queens from her; some of them were dark, although one of the dark ones was the cleanest and best to gather honey I had in 1914."—T. W. Frood, Renfrew, Renfrew County.

"Re queen received in June, 1913, from E for testing—may say that her colony has so far resisted European Foul Brood and are excellent honey gatherers."—J. R. Mills, Richmond, Carleton County.

"In reference to the queen sent me in June, 1913, will say that I successfully introduced her, built up a strong colony and they came through the winter in first class shape giving me in 1914 about 40 lbs. of first class section honey.

"You will remember about four years ago Foul Brood was the nightmare of the bee-keeper. Since then by tests and observations it has practically become the safety valve of the beekeeper. For the simple reason that if any bee-keeper allows his queens to become degenerate the disease appears. I claim that you have done more to promote beekeeping in the past two years by the distribution of queens than was done in 20 years before. It gives any man, especially a beginner, such a demonstration of facts that if he does not heed it, out he goes."—John Ray, Fort Erie, Welland County.

European Foul Brood was first reported in Ontario in 1907 in the apiary of Warrington Scott, of Wooler, Northumberland County. About the same time the disease was also reported in Carleton County. The spread has been from those two centres of infection, and no isolated outbreak has been discovered, with the exception of Welland County, where the disease is known to have come across the Niagara River from New York State. In Northumberland and Carleton the apiaries were practically all black bees, not very carefully kept, and it was found to run its course and destroy an apiary very rapidly. For example, one apiary of 112 colonies was reduced to 23 in two years. Another apiary of 180 colonies was reduced to 21 in one year. Another apiary of 60 colonies was reduced to 44 in one year and the balance all diseased the second year.

In 1910, the local inspector, Warrington Scott, reported: "I travelled over the same ground as last year and found that all the bees had been treated except one apiary, but very little Italianizing had been done, and consequently the

disease returned in every apiary and destroyed some of them completely. I found the disease spreading very rapidly. It has more than doubled since last year. I think if the Department could encourage the beekeepers to Italianize ahead of the disease it would prevent a great deal of loss, as the disease does not affect the Italians nearly so badly as the blacks."

In the *Canadian Horticulturist and Beekeeper*, for June, 1914, Mr. Scott writes: "If the disease returns in an Italian colony to such an extent that the half of the brood is dead, I have found that removing the queen for five days before introducing a new one works well, as it gives the bees a chance to clean up the combs before the new queen has a chance to lay. If more than half the brood is dead I would treat the colony by the shaking method. The best advice I can give to all beekeepers is to Italianize. You will be able to save considerable loss by doing so if you use Italian queens raised from vigorous stock. I have used the Golden bee with good results, but I cannot say that the three-banded or leather-colored Italians will not do as well under the same conditions provided they are of a vigorous strain. Vigor seems to count more than color. The successful honey producer of the future must keep his queens young. That is, he must not keep the queen longer than two seasons for the best results, and I am not sure but it would be well to requeen every year. It is very important when combating the disease to see that all queens are young. The remedy for the disease is exactly in line with the system of beekeeping that must be followed in order to obtain the highest success even if Foul Brood never existed. Keep your bees up to a high standard of vitality and it will make but little difference whether your neighbors are careless or not."

In March, 1915, O. L. Hershiser, of Kenmore, N.Y., told the writer that when European Foul Brood reached his apiary he found that some of his colonies resisted the disease, and he requeened the rest of the apiary from them, thus developing a resisting strain by selection. He did not know the origin of the stock and is not selling queens.

W. A. Smith, Wooler, had his first outbreak of European Foul Brood in '07, the same time as his neighbor, Mr. Scott.

In Jan. 1913, Mr. Smith wrote: "I received a queen from D about July 1st, 1911. I introduced her into a colony I had treated for E. F. B., and the disease did not appear again that season, but in the spring of 1912 her colony showed the disease in all stages. I let them go and they cleaned house and threw off a good swarm in clover flow and another in buckwheat. I would consider one strain of Italians as good as another as far as fighting disease is concerned, but I am certain the three-banded Italians are by far the best honey gatherers. Most of my bees are of H stock."

In Jan. 1914, Mr. Smith wrote again: "I have had experience with several different strains of Italians, namely: B, D, G, H, and we need not expect any of them to fight off the disease in every case the first year that they contract it. I inoculated a colony of pure bred H stock with E. F. B. in 1912, and it stayed with them the season through. In 1913, they were completely rid of it, so I would not advise turning any strain of Italians down if they do not fight off the disease the first season.

"Probably it would not be out of place if I would give you the results of an experiment which I carried out in 1912 and '13. I had several colonies with disease in 1912 which I treated. I selected the weakest one to stack the brood on. I placed three brood nests on this one with the diseased combs which were taken from the other three. I left them there for two weeks, then took the

brood nest which was on top and placed it on the stand, shaking the bees into it and leaving them on the diseased combs from which the brood had hatched. I watched them and they built up to a good strong colony by the end of the season of 1912, and in 1913 they did not show any disease and were among the best colonies in the yard, so I do not think it is necessary to destroy the diseased combs if you have pure-bred Italian stock."

In March, 1915, the following questions were sent to Warrington Scott: "I wish you would take the time to let me know how you feel now about the different races of Italians and their immunity to this disease. Who are the breeders whose queens you would recommend most highly at the present time? Do you consider that European Foul Brood becomes less virulent after it has been in a neighborhood for a few years? In other words, do you feel that it is necessary for a beekeeper after having Italianized his bees in advance of the disease to have loss of any account when the disease reaches him? From your knowledge of how this disease has operated in other parts, do you consider that the variety which you have had experience with is the same as what they have in New York State and elsewhere?"

Mr. Scott replied as follows: "I have used the G strain with good results. Mr. C. Sholm, of Wallbridge, requeened all of his colonies with the G strain in hopes that he could avoid treating them when the disease arrived, and it worked out very well. I examined his bees the following spring after Italianizing them, and although the disease had been present about a year I found that the well-bred goldens were quite free of the disease, while the dark-colored bees were quite badly affected, but there were none of the colonies which I thought it advisable to treat. I have always thought that the golden strain was more immune from E.F.B. than the darker strain, and am still of that opinion.

"Yes, I feel sure that the disease is much less virulent after being in an apiary a few years. I have always thought when reading a description of E.F.B. in the United States, that the disease there is much less virulent than what we have here.

"Since the disease has become less virulent in this locality I have changed to the H strain of dark or three-banded Italians, as I thought this strain sufficiently immune and believe they live longer than the golden strain, which of course is a benefit during the honey flow as well as in wintering. European Foul Brood is still among my bees, and there were quite a few cases last year which I believe was due to the poor and adverse year mostly."

U. H. Bowen, of Niagara Falls, is one of the most successful comb honey producers in the Province. Having his apiary of 200 colonies well in hand when the disease came along, his loss has been very slight.

In March, 1915, he writes: "In 1911 we purchased a number of Italian queens from C, and in 1912 we received 75 more queens from C, and a few from H. In 1913, we received 50 from I. I do not think any of these strains can be said to be strictly immune, but I would have no hesitation in saying that there is very little fear from the disease with either H or I strains. We have had quite a number of cases in colonies with C queens, but I would not say that they are of no value in eradicating the disease.

"I would like to give you a few extracts from my note-book, and you can judge for yourself as to the results:

"Hive No. 51 was given a C queen, Sept. 18th, 1912. Examined on May 16th, 1913, and found a lot of E.F.B. May 24th, 1913, took away all brood—

left 2 combs honey and 3 foundations, gave 3 frames healthy brood. On June 17th, 1913, a little E.F.B.—caged queen, June 21st, gave queen cell from No. 125, C stock, and took away old queen. August 16th, queen laying—brood O.K. Examined June 6th, 1914, and found no disease.

"No. 197, May 15th, 1913, black queen—one year old—brood 4 frames—some E.F.B. June 15th, dequeened; July 21st, gave queen cell from No. 125; July 24th, queen laying—some E.F.B. May 19th, 1914, no disease noticed; July 2nd, 1914, a lot of E.F.B. July 11th, gave queen just hatched No. 212, a daughter of a C queen; July 31st, queen laying. I am not positive, but think this colony had no more disease.

"No. 113, Sept. 7th, 1912, black bees with some E.F.B. gave a C queen; June 2nd, 1913, a lot of E.F.B.; June 21st, dequeened and gave a queen cell from No. 125; July 16th, queen laying; August 1st, brood apparently O.K.; August 27th, brood O.K.; May 19th, 1914, brood O.K.

"You will notice that two of these colonies, No. 51 and 113, had queens given them in September, 1912, and both had the disease quite bad in 1913. Three of them were dequeened in June, 1913, and on the same day, June 21st, each was given a queen cell from the same hive, No. 125, and two, Nos. 51 and 113, were cured and showed no signs of the disease in 1914.

"No. 60 was given an H queen October 5th, 1912. On May 16th, 1913, a few cells E.F.B. were found. They were given no treatment at all, but cleaned it all out themselves and are now free.

"No. 103 had some E.F.B. May 19th, 1911. On June 3rd, 1911, E.F.B. in every frame of brood; dequeened. June 12th, gave laying Italian queen from K stock. July 3rd, queen O.K., a few cells of E.F.B. July 22nd, brood O.K.

"Owing to unfortunate circumstances, was not able to follow up the disease closely in 1914, but I am satisfied that we have it well in hand, and we are not losing any sleep over the E.F.B. problem."

CONCLUSIONS.

The conclusion reached by the writer with reference to races and strains of bees is that resistance is more a matter of vigor than of race or strain. Results of tests show, however, that common black bees are exceedingly poor resisters, and that Carniolans are not generally as good as Italians.

Of the eleven strains of Italians tested none have been entirely condemned. All have been found able to resist European Foul Brood under careful management. Evidence in favor of leather-colored Italians is perhaps stronger than that for the yellower strains, and as we are coming more and more to the conclusion that the former are better as honey producers, they should probably be given the preference.

It is almost amusing to see occasional instances where black bees stand out as good resisters, as in the case of the one colony owned by Mr. Brown, of Castle-ton. At least two other similar cases have come under the observation of the writer, and in both cases they were small apiaries given very little care, but remaining free of disease, when larger apiaries all around were badly affected. It would be a matter of interest, if not of any great profit, to attempt to develop a strain of black bees resistant to European Foul Brood.

"The successful honey-producer of the future must keep his queens young and his colonies strong and vigorous. The remedy for the disease is exactly in line with the system of beekeeping that must be followed in order to obtain the

highest success even if Foul Brood never existed. Keep your bees up to a high standard of vitality, and it will make but little difference whether your neighbours are careless or not. With vigorous stock and careful attention, it is not necessary to destroy combs in the treatment of this disease."

The above words of Warrington Scott cannot be too often repeated.

So far as it can be seen by the careful observer who is not a bacteriologist, the disease diminishes in virulence after it has been in a particular locality for a few years. It is also true that the resistance of the bees increases as a result of natural selection or "survival of the fittest." On the other hand, apiaries previously Italianized and carefully watched when the disease arrives are not so badly affected.

In 1910, West, of New York State, wrote favoring both reduced virulence and increased resistance. "European Foul Brood is not so virulent after it has been in a colony for two or three years as it is at first. Many weaker colonies die off and some do not, and from such, a race more immune to the disease starts up."

The fact that Stewart's "D" stock from an apiary of good resisters in New York did not resist in Brown's apiary in Ontario, indicates greater virulence in the newer disease district. This is further supported when it is considered that Brown's case of disease was of recent origin, while Smith, who had the disease for five years, found the D stock to be good resisters. Scott's statement that he now considers it safe to introduce a less resistant race and West's statement that Capt. Hetherington's success with Carniolans may be accounted for by the fact that "he had passed over the worst of E.F.B. before he tried them," indicate diminishing virulence. Scott's further statement: "I feel sure that the disease is much less virulent after being in an apiary a few years," and the fact that the New York State outbreak was reported in 1897—ten years before it was heard from in Ontario—probably accounts for certain marked differences in symptoms of the disease as reported in New York and in Ontario.

One fact is clear, that, from whatever cause, European Foul Brood is more easily controlled after it has been some years in a locality.

The educative value of this work is very gratifying. For instance, the experimenter at Fort Erie, who pays such a high tribute to the distribution of queens, was just three or four years ago violently opposed to apiary inspectors and all their deeds.



