

Rothamsted Experimental Station, Harpenden, - T. Palmer-Jones
Bee Department.

Work on Treatment of Bee Diseases - Dr L. Bailey.

European Foul Brood. The effect on E.F.B. of the quaternary ammonium compounds such as Cetavlon and Deciquam is being tested. Deciquam has been found to destroy E.F.B. but is too toxic to bees in the necessary concentration.

I Laboratory Methods: These compounds are tested on larvae reared artificially in polythene cell cups kept in jars above 2% KOH solution. The KOH keeps the humidity at about 90% and removes excess CO₂. Incidentally, it has been found that combs made of polythene are useless for practical beekeeping because the wax moth will bore through them. Perspex can be used instead of polythene and round holes may be bored in it instead of the usual hexagonal ones. The polythene or perspex cups are stored in alcohol to keep them sterile.

Testing of Cetavlon: Three bee larvae infected with E.F.B. were removed from a hive and ground up in a mortar with 5 cc of distilled water. The strength of the infection was tested by spreading a standard loop of the suspension obtained over an area of one sq. cm. marked on a slide and examining the smear under the microscope against a nigrosin background. If necessary, larvae may be kept alive after removal from a hive for several days in a refrigerator at 3°C.

Serial dilutions of the suspension were then prepared, using Cetavlon as a diluent, so that the infected material was exposed to one part of Cetavlon in 1000, 10,000, and 100,000. These dilutions were stored for 24 hours in a refrigerator at 3°C. It appears possible that larvae infected with E.F.B. may contain some volatile toxic substance as sometimes, when their freshly ground-up bodies are used in tests on healthy larvae grown in cell cups, unexpected mortality of these occurs. If this material is kept for some days before use, however, such mortality does not occur.

Then a loopful of royal jelly was placed in all the cells of four pieces of polythene comb, each of which contained twelve cells. One such group of twelve cells is always used for testing each dilution or as a control.

A two day old larva was then put on top of the royal jelly in each cell and the four pieces of comb placed above the 2% KOH in four screw-top jars after inoculation with loopfuls of 1/1000, 1/10,000, 1/100,000 Cetavlon plus the undiluted suspension of ground-up larvae as a control. The jars were kept in an incubator at 34°C. This operation was completed at 5 p.m. At 10 a.m. next day the larvae were given a loopful each of royal jelly, and at 6 p.m. a loopful of special yeast food - 25% honey and 10% yeast extract (Difco). The royal jelly was stored in the inner cabinet of a refrigerator at -10°C. Under such storage conditions it can be held for a year. On the third day yeast would have been fed the larvae at 10 a.m. and 6 p.m., but feeding was discontinued as the larvae were mainly dead.

A fine pipette with a very small bulb is used to deliver a drop of yeast extract on top of the larvae. A fresh pipette is used for each group of cells and it is placed in lysol after use. The platinum loop used to deliver royal jelly and other material to the larvae is flamed when appropriate.

Further Tests Commencing 19/7: Larvae two days old were placed on loops of royal jelly in cell cups at 10.30 a.m. At 11 a.m. another loopful of royal jelly was given to ensure an adequate food supply, and the larvae were inoculated, in the usual groups of twelve, with loopfuls of 1/1000, 1/10,000 and 1/100,000 Cetavlon. One group was also inoculated with the undiluted infected material, and an untreated control group was maintained. 19/7. 6 p.m. Royal jelly fed. 20/7. 9.30 a.m. Yeast extract fed and also at 1 p.m. and 5.30 p.m. On 20/7 all the larvae were alive except those treated with 1/1000 Cetavlon which is thus shown to be toxic in this concentration. 9.30 a.m.: Yeast extract fed. Nonn: Yeast extract fed, larvae short of food. 5.30 p.m.: Yeast extract fed. 22/7 Larvae killed and smears prepared.

The experiment showed that concentrations of 1/10,000 and 1/100,000 Cetavlon prevented the infection of all larvae. Undiluted infected material caused disease in several larvae.

NOTES: The Americans rear larvae three days old on nylon gauze touching cotton wool soaked in the yeast plus honey solution already described.

Larvae can be conveniently transferred by sucking them against a fine opening at the end of a glass tube.

Mortars and equipment used for handling E.F.B. are sterilised in Lysol to prevent the disease spreading to apiaries.

II Field Methods: Experiments are being conducted on the feeding of Cetavlon to hives infected with E.F.B. and the spraying of combs of such hives with it. The mode of transmission of E.F.B. is being studied.

An E.F.B. infection always drops in summer during the honey flow. Is this due to the antibiotic effect of freshly gathered honey? Some authorities have found that honey has such an effect but it does not last.

ACARINE DISEASE: Efforts are being made to discover an acaricide which will destroy the mites with one or two applications, and not eight, as in the case of Folbex.

Ovetran or PCPCBS. Strips of heavy blotting paper were soaked in 5% NaNO₃ and dried, then soaked in ovetran and dried. Finally they were folded in a "V" shape, with holes punched along the mid-rib to assist combustion, macerated with a file, and burnt in hives to find what effect the fumes would have on the bees and queens. It was found that the bees in strong hives were excited and dropped down on the burning strips which they put out. In weaker hives the strips burnt satisfactorily.

NOTE: PK and dimite have the same effectiveness against acarine as chlorbenzylate.

Steps to Take if Acarine Found in New Zealand: Dr. C.G. Butler considers as did the Swiss, that if acarine was found in one apiary it would already have spread to others. He suggests:

- (i) All bees should be destroyed in the infested apiary.
- (ii) A cordon 3 - 5 miles in radius be put round the infested apiary and no bees be allowed in or out.
- (iii) Examination of all hives within the cordon should be made and infested bees destroyed, if practicable, or treated with an acaricide such as Folbex.

- (iv) we should cease all importations of bees from the U.S.A. whose bees were destroyed in such an emergency - perhaps a type of insurance.
- (v) I consider we should have the means to compensate beekeepers

NOSEMA DISEASE: The effect of pH upon the effectiveness of fumagillin is being studied by feeding solutions of it to bees artificially infected to the maximum with Nosema.

The effect of sugar syrup upon fumagillin is being estimated by making up the fumagillin in sugar syrup and keeping the solution from 1 - 6 months when it is tested against Nosema-infected bees.

Artificial Infection of Bees with Nosema: A dose of one million spores per bee ensures that the bee becomes heavily infected with Nosema. The spores are obtained from the intestines of infected bees and counted in a haemocytometer. They are fed in sugar syrup on the wires of a cage to 180 bees at the rate of a million spores per bee. The bees are not given sugar syrup until they have consumed this infected material. Then they are supplied with water and sugar syrup.

Acetic Acid: A very effective method of treating Nosema depends on exposing infected material to acetic acid fumes. These fumes also kill the eggs and larvae of the lesser wax moth in 24 hours. Experiments are now being carried out to discover if the greater wax moth is also killed. (See reprints).

Transfer of Combs: Nosema may be treated by placing the queen bee and one comb of brood in the centre of a super of foundation comb which is separated by a queen excluder from the old brood chamber placed underneath. The old brood comb is removed as soon as possible. This method depends on the fact that dried faeces in combs carry the Nosema spores and spread the infection. Acetic acid kills the spores in dried faeces. (See reprints for full accounts of above.)

Apparatus for Collecting Samples of Bees: The rapid removal of samples of bees from hives is often necessary for diagnosis of disease or to study the effect of treatment. A very convenient apparatus has been designed at Rothamsted for the purpose. In brief it consists of a piston which sucks the bees into a removable sampling chamber. The apparatus is compact and hand-operated. A scale drawing has been made.

U.K. and Importation of Bees: The importation of queen bees from Italy was stopped some time ago more because the bees were heavily infected with Nosema than because of Acarine infestation.

The U.S.A. has only recently banned the importation of bees from European countries, and much acarine must have been brought in before this measure. But apparently it has not become established there. During a visit just after the last war Dr. Butler dissected bees in many parts of the U.S.A., but never found one acarine infestation. But bees in the U.S.A. have a serious type of Nosema and E.F.B. is widespread.

Hive Ventilation: It has been found at Rothamsted that bees winter much better in a humid atmosphere if small vents are put in their hive lids. These vents are two in number and placed opposite each other. Diagrams showing their location have been obtained. The use of these vents in many parts of New Zealand would help to reduce excessive moisture in combs removed for extraction.

Bee Behaviour: Mr Ribbands has been carrying out experiments on the scent of bees. He has found that the scent of the bees in a hive is determined by the type of nectar they are collecting. Bees from different hives can enter each others hives with impunity if they are collecting the same nectar.

There is evidence that queen bees can be safely interchanged between hives collecting the same nectar.

I spent some time with him in Wales working on this subject. We brought up ten hives which, together with another ten, were placed in two groups on the heather. Before being brought to the heather all surplus honey was removed so that after a few days all the hives would have stored only heather honey under like conditions. Then the queens in each group were interchanged without any losses.

Factors affecting the Nectar Secretion of White Clover. The opinion at Rothamsted is that farming practices that enrich the soil and favour growth of white clover also favour nectar secretion. But application of ammonium phosphate or other treatments which cause rank growth reduce nectar secretion as the growth occurs at the expense of the nectar producing plant substances.

Beeswax. Much beeswax is imported from E. Africa and used in foundation comb which is often unsatisfactory in performance owing to the low m.p. of such waxes. A market is open to New Zealand in this sphere.

Nicotine Sulphate as a Repellent. Kelsey states in a letter of April 1st 1955 that the addition of nicotine sulphate at the rate of 1 part in 1,280 of D.D.T. spray would repel bees. Dr. Butler does not agree and states that nicotine sulphate is in any case too volatile to last long, whereas D.D.T. is persistent.

Pollination of Red Clover. Dr. Butler asserts that under the conditions found in the U.K., very good pollination of this crop with hive bees takes place. These often collect extractable quantities of red clover honey. Bumble bees are not needed. This does not necessarily apply to New Zealand conditions.

Pollination of Brood Beans. Hive bees pollinate these very efficiently and bumble bees are quite unnecessary for this purpose. The beans have extra floral nectaries which are sometimes visited by bees instead of the flower nectaries. Hive bees also sometimes collect nectar through the holes bored at the base of the flowers by bumble bees.

Importation of Bumble Bees. Instead of importing bumble bees as pollinators perhaps it would be better to bring in the small bee *Melipona Iridapennis*. (Really a Trigona bee). This is very prevalent in South India and Ceylon and is an excellent pollinator. The colony has multi-queens and does not swarm away. The bees store very little honey. The bees would be unlikely to live in the colder parts of New Zealand.

Cost of Running Rothamsted Bee Department.

Apparatus and hive maintenance		£2000
Professional Staff	{ Salary Dr. Butler	1850
	" Mr Ribbands	1355
	" Dr Bailey	1062
	" Mr Simpson	1077
	" Dr Free	722
	" E. Carlisle	868
	" Apiarist	785
	" Lab. assistants	625
	" " "	290
	" " "	300
	" " "	403
	" " "	375
	" " "	355
	" " "	403
" " "	403	
" " "	306	
" " "	403	
" " "	300	
Casual		

(Contd)

Cleaners and caretakers

£400

All the above salaries are paid plus 10%

REPORT VII APND	Total salaries	£12,282
	10%	<u>1,228</u>
	Total:	<u>£13,510</u>

Expenditure: Wages and Salaries £13,510
 Apparatus and hive maintenance £2,000

If allowance is made for travelling expenses and building maintenance the total expenditure would be over £16,000. Recently invented an instrument called an apiductor which he will use during World War II. During World War II beekeeping was regarded in the U.K. as an essential industry and supplies of sugar were made available to all beekeepers, even those with one hive.

The average annual crop of honey produced in the U.K. is difficult to estimate, but would probably not exceed 1,000 tons. Hives in an apiary require attention. Two of these instruments have been flown to New Zealand for the first extensive trials made. If the trials are successful, the apiductor will be of great value to commercial beekeepers.

Bee Research Association: ***** a day with Dr Crane, Director of the Bee Research Association. The Association has an interest

REPORT VII APIDICTOR, SIGHT GLASSES, DESTRUCTION
DISEASED BEES, ETC.

Apidictor: Commercial beekeepers must examine hives at intervals during the spring to prevent swarming, which weakens the hives and reduces their honey crop. Hive examination is heavy work and costly in labour. Mr E.F. Woods, a Sound Engineer, has recently invented an instrument called an apidictor which he claims will detect swarming in beehives in a few seconds without the need to pull them to pieces and examine the combs. It consists of a microphone which is inserted in the hive entrance and picks up the special sounds emitted by bees in a hive when it is preparing to swarm. These sounds are relayed to the beekeeper through amplifying and screening equipment and he then knows which hives in an apiary require attention. Two of these instruments have been flown to New Zealand for the first extensive trials yet made. If the trials are successful, the apidictor will be of great value to commercial beekeepers.

Bee Research Association: I spent a day with Dr Crane, Director of the Bee Research Association. The Association has an immense collection of books, reprints, journals, etc., dealing with every aspect of beekeeping. I was able to buy from the duplicate collection of journals nearly all the missing numbers of the Bee World needed to complete the set at Wallaceville Animal Research Station.

Poisoning of Bees by Dusts and Sprays: No legislation dealing with this subject exists in the United Kingdom. I have, however, obtained full copies of that in force in Germany and France. The German decree has been translated into English for me.

Standard Colour Glasses for Honey: The National Beekeepers' Association asked me to investigate the possibility of securing standard colour glasses to enable producers to pack uniform grades of honey for the local market, in line with standard packs of the Honey Marketing Authority. Three 2-oz. sample bottles of liquid honey were received from Mr R.S. Walsh, Honey Grader. These were matched as follows:-

Colour	100
"	87
"	60

Messrs Kodak Co., Harrow and Wealdstone, near London, recently prepared colour glasses for British beekeeping organizations and particulars are given in Honey Grading Glasses. British Standard 1656: 1950. I found Messrs Kodak willing to undertake the preparation of such glasses for New Zealand. A set of three, two inches square, would cost approximately 12/- for a minimum order of 150 sets. But the firm state it would be extremely difficult to prepare separate colour glasses to match the honeys with 100 and 87 points as there is so little colour difference between them. How close must the colour glasses be to the samples

submitted, i.e. how many points could they deviate + or - following
Would it be possible to use two colour glasses instead of three,
one glass to match colour 60 and one to match colour 90, say, as
is done in the United Kingdom. This would mean that honeys over
60 and under 90 would fit in the intermediate class. If it were
possible to use an arrangement like this, the cost of the glasses
could be reduced.

Mr P.S. Milne, N.A.A.S. Beekeeping Advisory Officer at Rothamsted:

Much valuable information has been obtained from Mr Milne;
it includes film strips, information on spray poisoning, diagnosis
of disease, and work of the advisory service.

I was shown a viewing box containing an ultraviolet bulb which
had been found very useful in demonstrating the presence of American
foulbrood in the scale stage in combs. The scales fluoresce and
can be immediately recognized.

The ultraviolet bulb is mounted horizontally and the light is
concentrated to some extent by a lens so that it falls over an area
large enough to cover most of the comb being examined. Material
required:-

125 Watt black glass mercury lamp MBW/V
for 240-250 volts

£3. 0. 0

Choke type Z1838

44.19. 0

3 slot B.C. lamp holder, brass, back
plate type S3158

3. 2

The above apparatus would be very useful at Wallaceville.

Mr N.E. Gallagher, Park Crescent, Portland Place, London:

Mr Gallagher is interested in acting as an agent for the
marketing of New Zealand section honey. I gave him full informa-
tion on the subject and he is writing to Mr Field at Foxton.

Course for Field Officers of the N.A.A.S.: This course was held
at Westham House, Barford, Warwick, for four days. It was
attended almost solely by Field Officers, who correspond to Apiary
Instructors in New Zealand. Lectures and demonstrations were
given and I lectured on New Zealand beekeeping. The course was
most interesting and I was impressed by the standard of those
attending. However, the organization of the Advisory Officers
is very cumbersome and they are responsible to several authorities,
which does not make for efficiency in the field.

Building Research Station, Garston, Watford: I visited this
station to find out if any new paints or preservatives suitable
for bee hives had become available. It appears that we have
nothing to learn regarding the preservation of timber with
substances like Celcure. However, the Station was helpful in the
matter of paints and I have much information on two-paint systems
which will be of use in New Zealand.

Destruction of Bees in Hives Infected with A.F.E.: The following method is based on trials carried out at Rothamsted, and after further tests in New Zealand may be found to be the answer to this problem. When applied to a hive the aerosol at once prevents the bees flying and they can be burnt without the danger of any recovering.

Destruction of Honey Bee Colonies using Pyrethrum Aerosol.

Apparatus.

1. Aerosol Projector Ex. Messrs Sparklets Ltd.,
Queen Street, N.17.
Volume of container 100 ml.

Materials. For each hive 1 Sparklets bulb.
70 ml. solution containing

Pyrethrum Extract	25%	4 ml.
Acetone		36 ml.
Tetrachloroethane		30 ml.

1 newspaper

Procedure.

Insert nozzle of projector in the entrance of the hive and give one short spray into the hive. Block up the entrance except for a small hole with paper. The initial dose of pyrethrins will activate the bees. Spray in 2/3rds of the remainder into the hive, both upwards through the entrance and down through the feed hole. Wait for two minutes, loosen the crown board spray across each corner of the combs, refit crown board and leave the hive for at least ten minutes but preferably longer.

Care must be taken to allow the projector to stand for a while after filling, to ensure that the temperature of the liquid equals atmospheric values. Cold liquids will result in poor atomisation.

The addition of a curved end to the nozzle will improve its use on hives.

Purchase of Extract.

The Overseas agents for the Pyrethrum Board of Kenya and other sources of African Pyrethrum have no agents in New Zealand, but as the annual amount likely to be consumed is small, the London Agents, Messrs Mitchell Cotts Ltd, Winchester House, Old Broad Street, E.C.2, have undertaken to ensure the availability of this material on the receipt of a direct order. The current prices are about £4 per pound of extract. Please quote reference P/1101(B)/5613.

Various: I visited Dr F.N. ^wHomes, Kew Gardens, an authority on bee plants, and attended lectures on biological aspects of the transmission of disease at the London School of Hygiene and Tropical Medicine.

TRIP TO BOSTON AREA

In August I worked at Industrial and stayed there until the 15th, spending the time with Brother John of St. Mary's Abbey, Boston. It is a very effective bookkeeping and has specialized in printing and extracting leather books, with particular I.A. made long in my eye, particularly in being difficult to extract. It is very interesting in seeing the Brother John handle the

Brother John takes over all given last every year, most of which are used to replace the Abbey lives with rubber over the 3rd. There are three for the next year, prepared every year.

Industrial Rubber Abbey: I visited the press making agency in Boston, about 10 miles from the country, at a height of 1,500 ft. It is a different valley. Conditions here are ideal for controlled setting as there are no other trees with a radius of six miles and no woods will interfere themselves in the work. The setting houses are made to accommodate 12 labor half-dresses, each one being divided into two (quarters) in this time. Another division (quarters) by means of movable division boards gives four compartments each holding two half dresses. These setting houses are supported themselves, and a flexible gas can overtake in time, but they are well enough to prevent dress being raised. The correct type of dress is provided by full sized lives attached to the agency.

The setting houses are supported on single legs of pressure timber, and have a roof with a small gable and no lower timber set. The roof is covered by a chain with ~~gables~~ over the top and is attached to the legs.

Brother John in the setting: When the heavy flow is the for 1/2th, across, withly above, Brother John lives are used and in August to ~~October~~ there a small flow is prevented from the Brother. The agency of 12 lives is used

at a time in a truck. The hives are closed in front with wooden blocks and covered with wire screens. These are secured with two metal rods which have wing nuts welded to the top so that they can be screwed into metal threads fixed in the bottom boards. The apiarists are made ready for moving the day before. While at Buckfast I helped to prepare and move two apiarists. The bees are moved out between 5 and 6 a.m. when the air is still cool. The whole operation was very simple because of good equipment and organization.

Honey and Wax Extraction: Extraction of the non-heather honey crop proceeds on usual lines, a radial extractor and steam-heated uncapping knife being used. The heather honey is extracted by cutting out the combs, wrapping them in cloth, and placing them in an electrically heated hydraulic press which operates at a pressure of 0.63 tons per sq. inch. Twenty-three tons of honey have been pressed in twelve days with a loss of only 1.2% of honey. The press would cost approximately £1,500 now. The extracted honey, whether centrifuged or pressed, is pumped into storage tanks - eleven each of 2.5 tons holding capacity. All tanks are fitted with coils through which warm water can be circulated before the honey is bottled. Heather honey contains much water, up to 23%, and must be heated to about 130°F. to sterilize it and so prevent fermentation.

An automatic bottling machine which can fill 1,500-2,000 1 lb. cartons per hour is used. It was manufactured by the Roberts Patent Milling Machine Co. Ltd., Deane Road, Bolton.

The press used for extracting the heather honey was built by Messrs. Wilcocks, Dial Foundry, Buckfastleigh, Devon. This firm manufactures bee-keeping equipment for Buckfast Abbey, France, and Egypt. I interviewed Mr. Wilcocks and saw their honey tanks, radial honey extractors, and honey pumps.

these last are much more expensive than ones made in N.E. The other equipment is well made but would be expensive as it is not mass produced. The heather honey press showed extremely good workmanship. Similar presses have been manufactured for tropical countries with viscous honey, and for Mr. Gale a successful commercial British beekeeper. I have asked Mr. Wilcocks to send me specifications and prices of the honey press and other equipment.

ACARINE.

Acarine Disease: Brother Adam does not believe in treating acarine disease but in breeding bees that are resistant to it. He has bred a bee which is so resistant that acarine causes him no trouble, although bees in his district are usually very prone to develop the disease. The resistance is not due to yeasts on the bees attacking the acarine mite but is inherited as a dominant trait.

If acarine appeared in N.E. it would be worth considering bringing in some of these acarine resistant bees.

Adrenaline for Hypersensitivity to Bee Stings.

Adrenaline in a very convenient form for treating severe cases of hypersensitivity can be obtained from ~~Cameron~~^X Gerrard and Co. Ltd., Oldbury, Birmingham. One box of 5 x 1.1 ml. Amps. Injection Adrenaline Tartrate B.P. 1 in 2,000. The sterile ampule has a protected sterile needle which can be bared and pushed into the skin of the patient in cases where symptoms are too severe to risk waiting until the arrival of a doctor.