able to see earlier. In it he speaks of the results obtained by Certes who found that various infusoria, flagellates, and amoebae could be revived after five or six years only from the sediments on which he worked, whilst only *Colpoda* remained capable of revival after thirteen years of storage.

A reference is also given to a paper by Fauré-Frémiet¹ on a ciliate *Mycterothrix*. On looking this up I find that it records that Balbiani working with desiccated material containing cysts of *Mycterothrix* was able to revive the organisms by moistening after keeping the material dry for four years.

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NOTES ON A SCALE INSECT ATTACKING CACAO IN UGANDA.

IN 1909 a scale insect attacking cacao appeared in the Botanic Gardens. Specimens of this new pest were submitted for identification to Prof. Newstead, who described it as a new species, *Stictococcus dimorphus* Newst.²

The other food plants on which it has been collected by the writer are mulberry, *Markhamia platycalyx*, ornamental Hibiscus, *Anona muricata*, *Croton tiglium*, guava and *Cajanus indicus*. With the exception of *M. platycalyx*, all of these plants have been introduced, which, together with the fact that this Coccid has been found in the depths of a forest of something like 180 square miles on *M. platycalyx*, is conclusive evidence that it is indigenous and that it spread from that plant to the others.

From my observations cacao appears to be the favourite food plant. When the varieties of cacao, *foresteiro* and *creolle*, are grown side by side, the infestation on the former is invariably the most serious. The infestation on cacao is always restricted to the pods and stems of the pods, never having been found on the foliage or branches. (Fig. 1.)

¹ "Le *Mycterothrix tuamotuensis* (*Trichorhynchus tuamotuensis*) Balbiani." (*Arch. f. Protist.* xx, p. 223, 1910.)

² Newstead, *Bulletin Entomological Research*, vol. 1, p. 63, f. 2 (1910); Green, *l.c.*, p. 201 (1910).

Treatment. This is not readily killed by insecticides at the usual strengths; but, fortunately, on account of its always being located on the pods, insecticides can be used at greater strengths than they could be applied to the foliage in this country, where the trees are never dormant and where for some reason, probably altitude, oils applied at the usual strengths are most apt to "burn" the foliage.

I have experimented with a large number of contact poisons with the result that I favour the use of whale oil soap and soft soap-kerosene emulsion. The results of some of the experiments are tabulated below.

Spraying Experiments against the Cacao Scale, St. dimorphus Newst.

Experiment number	Treatment	Number of pods treated	First examination				Second examination				Third examination			
			Number of scales examined	Number of scales dead	Percentage of dead scales		Number of scales examined	Number of scales dead	Percentage of dead scales		Number of scales examined	Number of scales dead	Percentage of dead scales	
1	Whale oil soap	8	300	288	96.0		300	281	93.6		300	285	95.0	
2	Kerosene emulsion	8	300	226	75.3		300	214	71.3		300	210	70.0	
3	Carbolic acid emulsion ..	10	500	242	44.4		500	251	50.2		500	205	41.0	
4	Resin-soda wash	8	300	83	27.7		300	99	33.0		300	78	26.0	
5	Lime-sulphur wash	12	500	491	98.2		500	436	87.2		500	401	80.2	
6	Kerosene-lysol emulsion ..	12	500	268	53.6		500	261	52.5		500	274	54.8	
7	Soft soap-kerosene wash ..	12	500	482	96.4		500	469	93.8		500	456	91.2	
8	Check	—	300	23	7.7		300	17	5.7		300	28	9.3	

Experiment 1 was sprayed with whale oil soap, 1 lb. to 4 gallons of water.

Experiment 2. The formula of the stock solution of kerosene emulsion was:

Kerosene	2 gals.
Soap, hard	$\frac{1}{2}$ lb.
Water, hot	1 gal.

The stock solution was diluted to a 20 per cent. spray, *i.e.* 1 gallon of the stock solution was diluted with $2\frac{1}{3}$ gallons of water.

Experiment 3. The stock solution of carbolic acid emulsion was made according to the formula:

Soap, hard	1 lb.
Water	1 gal.
Carbolic acid, crude	1 pt.

One part of this solution was diluted with 30 parts of water.

Photo by T. D. Mailland

Fig. 1. A typical infestation of a pod of *Cacao theobromae* var. *forestiero*, with *Stictococcus dimorphus* Newst.

Experiment 4. The formula of the resin-soda wash was:

Soda, caustic	..	..	..	..	3 lbs.
Resin	..	..	..	..	10 lbs.
Fish oil	..	..	..	..	$\frac{3}{4}$ lb.
Water	..	..	..	..	25 gals.

Experiment 5. The stock solution of lime-sulphur wash was made according to the formula:

Lime, unslaked	..	..	..	..	20 lbs.
Sulphur, flowers of	..	..	..	..	15 lbs.
Water	..	..	..	..	50 gals.

and this was diluted to 85 gallons.

Experiment 6. Kerosene-lysol emulsion was made by emulsifying:

Lysol	..	..	..	..	3 ozs.
Kerosene	..	..	..	..	9 ozs.
Water	..	..	..	..	4 gals.

Experiment 7. The soft soap-kerosene wash was made by boiling together 8 lbs. of soft soap and 5 gallons of kerosene. On cooling this becomes a jelly, 10 lbs. of which was added to 30 gallons of water for use.

Experiment 8. For the purpose of comparison eight untreated pods were examined.

Natural enemies. I have frequently bred the Noctuid, *Eublemma costimacula* Saalm., of the subfamily *Erastrinae*, from this scale insect. During the examination of the pods treated with the above-mentioned sprays for dead insects several larvae of this moth parasite were found.

At a distance I have observed the bird, *Melanopteryx nigerrima*, picking at a cacao pod infested with this scale insect, but I could not be certain whether it was feeding on the scale insect or on the ants which accompany the scale insect.

The other local representatives of the genus *Stictococcus* are the species recently discovered by the writer, *St. formicarius* Newst., and *St. gowdeyi* Newst.¹ The former attacks a species of *Ficus*, and the latter *Harrografia madagascarensis* and coffee.

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¹ Newstead, *Bulletin of Entomological Research*, vol. iv, p. 70, f. 4 (1913).