

A Note on the Tapioca Scale (*Aonidomytilus albus*, Cockerell)

by

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Introduction: Tapioca (*Manihot utilissima*) is an important root crop grown extensively in Kerala and Andhra States and in parts of South Arcot, Salem, Coimbatore, Chingelput and Tanjore districts of Madras State. Though widely grown in this State, there is no record of any insect pest damaging the crop. Fletcher (1917) and Subbiah Mudaliar (1951) have mentioned that this crop is free from any insect attack. But recently a scale-insect *Aonidomytilus albus*, Ckll., was noted attacking the crop in a severe form in parts of Salem, Pattukottai and Coimbatore. This scale is a pest of plants belonging to the genus *Manihot* in foreign countries viz. Africa, Florida, West Indies, Mexico, Formosa, Argentina, Brazil, etc. and is known there popularly as Cassava scale. The report on the first occurrence of this insect in pest form was received from Salem in the year 1951 and later reports of such occurrence are from Coimbatore, Tanjore, and South Arcot. At present the infestation is getting widespread throughout the State, wherever Tapioca is grown.

The Scale, its Life - history and Habits: Swaine (1950) has worked out in detail the biology of the scale, at Tankanyika. The adult female is bag-shaped and reddish-purple in colour without wings and legs. It is covered dorsally with a silvery white scale of a waxy nature and shaped like a mussel shell. The male is of the same colour but is provided with well developed wings and legs. The eggs are laid by the female at the posterior end of the body and deposited between the upper scale covering and the lower cottony secretion. As the eggs are laid, the female gradually shrinks in length and finally shrivels up. The eggs are light pink in colour and hatch in four days. The nymphs that come out of eggs are oval in shape and have a depressed, pale pink body with two conspicuous black eye spots anteriorly. They are capable of active movement and are known as crawlers. They become adults in 20 to 25 days. The crawlers settle at one place on the host without moving and gradually lose their legs, and later on produce posteriorly a crescent of fine white threads which spread forwards to cover the upper surface of the body before becoming the adult female. The female begins to lay eggs in about

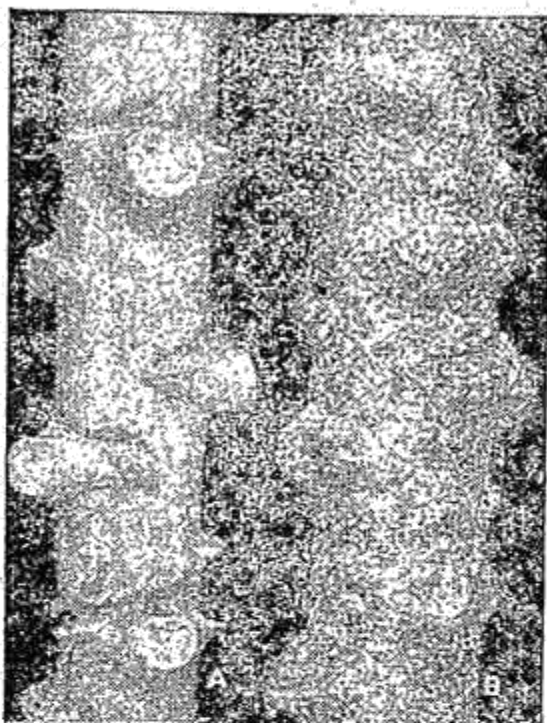
two days after reaching the adult stage. Those that become males move for sometime and finally after settling pupate, from which the males emerge out with three pair of legs and a pair of wings.

Nature of Damage: The scales are generally found on the stem of the tapioca plant and occasionally on petioles. They settle in large numbers on the stem and suck up the sap with the help of their long, threadlike proboscis. The damage depends upon the population of the scale built up during the early stages of the growth of the plant or later on when the plant has become well established. In the early stages of the crop the leaves lose their chlorophyll and gradually dry up, and the plants also will look stunted. In heavy infestation the drying up of leaves is followed by a complete desiccation of the stem and ultimate death of the plant. The grown-up plants which manage to withstand the attack generally develop poor roots. An infested plant can be easily detected by the stunted growth and pale yellow leaves. A close observation will reveal the presence of millions of the mussel-shaped scale remaining attached to the stem portion. The pest gets dispersed from plant to plant and field to field by active migration of the crawlers over the ground and by the passage of the crawlers from infested to clean materials when the cuttings are bundled prior to planting.

Control Measures: Swain (1950) recommends selection of clean planting material before planting and removal of infested cassava plants remaining in the field at the time of planting of new cuttings and burning them. The same author says that DDT oil emulsion gives some appreciable control of the scale. Mechanical methods like removal of infested plants as and when they occur tried in the localities where this scale was noted causing serious damage did not seem to control this scale satisfactorily. In the year 1951 the first report on a large scale outbreak of this scale was received from Salem by the Entomology Section, Coimbatore. The places were inspected and the pest was found in a very serious form in some of the riots' fields in Sooramangalam and Kannankuruchi tracts. The incidence of the scale in such a form was an experience by itself and opportunity was availed of to try some of the recent synthetic insecticides.

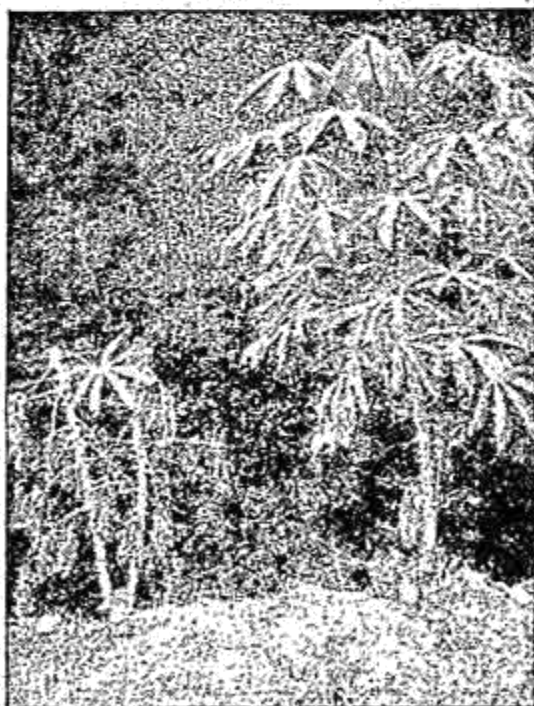
Experiments and Results: Investigations were first initiated in April 1951 by conducting two sets of large scale trials one at Sooramangalam and the other at Kannankuruchi with some of the new chemicals then available. The variants tried consisted

PLATE I



Tapioca stem
A. Healthy
B. Infested with scale

PLATE II



Showing a badly scale infested tapioca plant with stunted growth and dried up leaves and a healthy plant nearby.

of sprays of Parathion (Ekatox-20) at 1 oz. in $2\frac{1}{2}$ and 5 galls, DDT kerosene emulsion at 1 oz. in $\frac{1}{2}$ and 1 gall, BHC 50% wetttable powder at 1 lb. in $6\frac{1}{2}$ gallons, chlordane at 1 lb. in $6\frac{1}{2}$ gallons, HETP (Hexaethyl tetraphosphate) at 1 oz. in 3 gallons and Fish Oil Rosin Soap at 1 lb. in 6 gallons. Each chemical was tried on 20 cents area. The potentialities of the different chemicals were assessed by recording the adult population before and after one week and fifteen days of treatments on six cuttings of three inches length taken at random in each plot and working out the percentage of dead scales. The details are furnished in statements I and II. In these trials Parathion at both the concentrations was found to cause more than 95% kill of the scales. DDT kerosene emulsion and HETP sprays were found next in order of efficacy. In the case of the former scorching of the leaves was noted even at the lower concentration.

The investigations were resumed during 1954 at Central Farm Coimbatore where the tapioca crop was found infested with the same scale in a serious form. In this trial only Parathion and HETP were selected from those insecticides tried at Salem deleting others and along with these two chemicals, some more new insecticides were tested including some of the systemic poisons. The variants tried were Parathion (Folidol E 605) at 1 oz. in $12\frac{1}{2}$ gallons, Systox at 1 oz. in 4 gallons, Pestox 1 oz. in 4 gallons, HETP at 1 oz. in 3 gallons, TEPP (Tetraethyl pyrophosphate) at 1 oz. in 3 gallons Malathion at 1 oz. in 3 gallons, and Toxaphene emulsion 1 oz. in $6\frac{1}{2}$ gallons. The results were assessed in the same way as the previous trial. The data is furnished in table III. In this trial also parathion was found best giving the highest kill of the scale. Next in order of efficacy was Systox. Other chemicals were not found very effective on this scale.

Conclusion: It can be seen from the data gathered in the above trials that among the various insecticides tried Parathion, Systox and DDT kerosene emulsion were found to give some appreciable kill of the scale. Among the above three products Parathion seems to be the best. DDT emulsion causes scorching of leaves even at the low concentration and hence cannot be recommended. Systox is still in the experimental stage and hence Parathion in the form of Folidol E 605, which is already in popular use for control of certain other pests is recommended. The cost of spraying of this chemical works out to rupees ten only per acre. Since this chemical is poisonous, care should be taken in handling this and it is preferable to stop its use a month before harvest of the produce.

Lastly it should be remembered that the pest can to a certain extent be checked by using healthy sets for planting and also removing infested plants at the early stages of the infestation. The use of the insecticide is recommended only when the pest occurs suddenly in a severe form when the mechanical methods are not feasible. In serious outbreaks one or two rounds of sprayings with Folidol will minimise damage by this pest.

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TABLE I

Trials at Sooramangalam (Salem District.)

Population of scales on six cuttings taken at random before and after treatments.

No.	Treatments	Before treatment			After one week of treatment			After 15 days of treatment		
		Total No. of scales 1	No. of dead scales 2	% of dead scales 3	Total No. of scales 1	No. of dead scales 2	% of dead scales 3	Total No. of scales 1	No. of dead scales 2	% of dead scales 3
1.	Parathion (Ekatox 20) 1 oz. in 2½ gallons	550	..	..	428	382	89.2	352	353	99.4
2.	Parathion (Ekatox 20) 1 oz. in 5 gallons	667	..	..	510	472	92.5	318	310	97.4
3.	DDT kerosene emulsion 1 oz. in ½ gallon	674	..	..	413	322	77.9	313	266	84.9
4.	DDT kerosene emulsion 1 oz. in 1 gallon	506	..	..	521	321	61.6	422	307	72.7
5.	BHC 50% w. p. 1 lb. in 6½ gallons	414	..	..	612	218	35.6	314	112	35.7
6.	Chloradane w. p. 11 lb. in 6½ gallons	431	4	0.93	413	112	27.1	513	114	22.2
7.	HETP 1 oz. in 3 gallons	363	..	..	428	228	53.3	429	208	71.6
8.	Fish Oil Rosin soap 1 lb. in 6 gallons	523	..	..	613	27	5.2	515	51	11.2
9.	No treatment	635	..	..	562	..	..	472	..	..

TABLE II

Trials at Kannankurichi, (Salem District.)

No.	Treatments	Population of scales before and after treatments								
		Before treatment			After one week of treatment			After 15 days of treatment		
		1	2	3	1	2	3	1	2	3
1.	Parathion (Ekatox 20) 1 oz. in 2½ gallons	514	12	2.3	419	311	74.2	319	314	98.4
2.	-do- 1 oz. in 5 gallons	419	..	..	529	326	61.6	328	313	95.4
3.	DDT Kerosene emulsion 1 oz. in ½ gallons	616	18	2.9	329	184	55.9	418	298	71.3
4.	-do- 1 oz. in 1 gallons	521	27	5.2	514	228	55.1	427	284	66.8
5.	BHC 1 lb. in 6½ gallons	721	..	..	428	121	28.5	437	129	29.5
6.	Chlordane 1 lb. in 6½ galls.	419	..	..	519	119	22.9	514	114	22.2
7.	HETP 1 oz. in 3 gallons	513	8	1.5	617	279	45.2	611	428	70.1
8.	Fish oil Rosin soap 1 lb. in 6 gallons	478	19	3.9	410	22	5.4	524	74	12.2
9.	No treatment	594	7	1.2	511	11	2.1	618	13	2.1

TABLE III

Trials at Central Farm, Coimbatore.

No.	Treatments	Population of scales before and after treatments								
		Before treatment			After one week of treatment			After 15 days of treatment		
		1	2	3	1	2	3	1	2	3
1.	Parathion (Folidol E. 605) 1 oz. in 12½ gallons	204	..	..	261	144	55.2	268	261	97.4
2.	Systox 1 oz. in 4 gallons	282	4	1.4	199	165	82.9	214	209	97.7
3.	Pestox 1 oz. in 4 gallons	110	..	..	188	32	17.0	234	168	71.3
4.	HETP 1 oz. in 3 gallons	354	..	..	438	270	61.5	330	242	73.3
5.	TEPP 1 oz. in 3 gallons	359	3	1.0	477	241	50.5	301	199	66.1
6.	Malathion 1 oz. in 3 galls.	333	..	..	237	129	54.5	366	289	78.9
7.	Toxaphene emulsion 1 oz. in 6½ gallons	337	..	..	222	47	21.2	269	88	32.7
8.	No treatment	393	4	1.3	453	7	1.5	383	17	4.4