Q. Jl. Rubb. Res. Inst. Sri Lanka (Ceylon) (1973) **50, 223—227**

RECENT EXPERIMENTS ON THE CONTROL OF ABNORMAL LEAF FALL DISEASE OF RUBBER IN INDIA

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SUMMARY

Abnormal leaf fall disease is an annually recurring disease of rubber in India. Prophylactic spraying of copper fungicides before the onset of the South-West monsoon had become a routine cultural operation among estates and smallholdings. Pre-monsoon protective spraying was carried out with rocker sprayers using Bordeaux mixture or low volume application from the ground, with micron sprayers and aerial application from helicopters. The cost of spraying was steadily increasing, fiel experiments carried out with new copper fungicide formulations and low UR value diluent mineral oils have established that satisfactory disease control could be obtained with these new formulations. By use of these materials, which are now recommended for large scale use in rubber plantations, considerable saving in spraying cost could be achieved.

Abnormal leaf fall disease on an epiphytotic scale occurs on rubber trees in India during the South-West monsoon, every year. Though the severity of infection may vary in different years, depending on the intensity of the monsoon, this disease has never been absent in any year since it was first reported by McRae (1918). Because of the regular occurrence of the disease, pre-monsoon prophylactic spraying of rubber trees in both immature plantations and mature plantations with copper fungicides has become a routine cultural operation. In the estates sector, all the areas except the old slaughter tapped trees which are to be replanted in an year or two, receive pre-monsoon prophylactic spraying. In a recent survey, it was revealed that pre-monsoon spraying of rubber plants with copper fungicides is a regular cultural operation, even among the small holders (Unny & Jacob, 1972). It was found that the area receiving protective copper spraying is on the increase every year. The data on the total area aerial-sprayed is given below :

TOTAL AREA AERIAL-SPRAYED FROM 1968-1972

Year		*Area (ha)*
1968	—	14,600
1969	—	15,400
1970	—	20,300
1971	—	24,300
1972	—	33,900

Even though exact data are not available, it is estimated from the total quantity of copper fungicides sold during each year, that the area sprayed from the ground using high volume sprayers and low volume micron sprayers is also on the increase.

Three methods of rubber spraying are in vogue at present. They are (i) high volume spraying with rocker sprayers using about 4,400 l. of Bordeaux mixture per ha (ii) low volume spraying with micron sprayers from the ground using 6.2 l. of oil based copper oxychloride (40%) in 31 l. of diluent mineral oil per ha (iii) aerial spraying with helicopters using 6.2 l. of oil based copper oxychloride (40%) in 37 l. of diluent mineral oil per ha.

Though protective spraying against abnormal leaf fall disease of rubber is becoming more and more popular among estates and smallholdings, the cost of spraying is also registering a steady increase. The comparative cost of spraying per hectare that prevailed during the 1965, 1968 and 1970 seasons, for each method of spraying, is given in Table 3.

The cost of materials used for spraying has increased mainly because the products or raw materials required for the manufacture of fungicides and diluent oil are imported and their cost is increasing rapidly. The increase in labour wages both in the manufacturing centres and in plantations also contribute substantially to the increase in the cost of spraying. As the annual expenditure on spraying is one of the major items contributing to the cost of production of rubber in India, and any steep increase in this item will in turn reduce the profitability of the crop, field experiments were conducted with a view to reducing the cost of spraying.

Fungicides

Micron spraying experiments conducted during the years 1958-1960 (Ramakhrishnan, 1960) and commercial aerial spraying in latter years indicated that 4.482 kg of copper per ha was the optimum for the effective control of this disease. The quantity of copper used per ha was reduced to 3.568 kg by using a 35% oil based copper oxychloride formulation instead of 40% which was recommended earlier; but the amount of oil used per ha was retained in order to get the same coverage. This oil based copper oxychloride (35%) formulation was used for experimental spraying during three consecutive years for micron spraying and in two seasons for aerial spraying, and the results are summarised in Table 1.

TABLE 1

PERCENTAGE OF LEAF RETENTION IN SPRAYED PLOTS

Year	Oil-based copper 35%		Oil-based copper 40%	
	Micron	Aerial	Micron	Aerial
1968	61%	—	75%	—
1969	73%	77%	76%	78%
1970	76%	67%	75%	75%

The results indicated that this formulation was also effective in controlling the abnormal leaf fall disease of rubber and hence this was recommended for large scale use in rubber plantations. This formulation costs only Rs. 20.50 per l as compared to Rs. 23 per l of 40% oil-based copper. The use of this formulation will result in substantial savings in total spraying costs as the plantation industry used about quarter million l of oil-based copper during the 1972 season.

The shelf life of both 35% and 40% oil-based copper oxychloride in the paste form were poor, though they were very effective in controlling the disease. Carry over stock of these fungicides required reconditioning before use during the subsequent season, as they caked up in the containers and the dispersing of the material in diluent oil was difficult. Addition of diluent oil, dispersing agents, fillers and stickers in the technical copper oxychloride to make it into a paste form, contributed to the higher cost of these fungicides. Expensive metallic containers required for the packing of these fungicide formulations also contributed to the high cost of these materials. Therefore, copper oxychloride (56%) in the powder form incorporated with stickers and other dispersing agents, was used for field trials, against the abnormal leaf fall disease of rubber. Leaf retention in the plots sprayed with this formulation was found to be satisfactory in comparison with oil-based copper. The results are given in Table 2.

TABLE 2

PERCENTAGE OF LEAF RETENTION IN SPRAYED PLOTS

Year	Oil dispersible copper oxychloride (56%)		Oil-based copper (40%)	
	Micron	Aerial	Micron	Aerial
1970	75%	79%	76%	76%
1971	65%	75%	64%	72%

The quantity of the oil dispersible copper oxychloride (56%) in the powder form, required to deliver 4.482 kg of copper per ha was 8.03 kg. The cost of this was Rs 123.50 as against Rs 142.60 for 6.2 l of 40% oil-based copper for delivering the same quantity of copper per ha. However, in the case of oil dispersible copper oxychloride 42 l of diluent mineral oil was recommended for aerial spraying, to keep the volume of fungicide oil mixture used per ha the same as in the case of 40% oil-based copper. Even then the saving in spraying cost per ha was about Rs 11.50 when this fungicide was used for aerial spraying. In addition to saving on spraying costs, the shelf life of this fungicide, packed in sealed polythene bags, was found to be very much better than the oil-based copper oxychloride fungicides in paste forms. Hence carry over stocks of this formulation could be used during the subsequent season without reconditioning.

Diluent mineral oil

The use of mineral oil as a fungicide, as a sticker or as a carrier for other fungicides, in plant protection is a recent development. There are reports on the occurrence of phytotoxicity on the foliage of several crops when mineral oil was sprayed (Calpouzes, 1969). Unsulphonated residue (UR) was reported to be one of the important factors in the mineral oil, causing phytotoxicity on foliage (Pearson, 1958). Hence mineral oils with UR values above 90% are only being recommended for crop spraying in other countries. Adopting this recommendation, imported spray oils of this grade are being used for rubber spraying also.

Manufacture of spray oil grades with UR values above 90% involved costly processing of the base stock resulting in a very high price for the finished product. During the years 1969 and 1970, though the spray oil conforming to the specifications of the imported grade was manufactured locally, the cost of the product was high, the supply uncertain, and the material scarce during the spraying seasons. To counter these situations, field experiments were carried out with diluent mineral oils with low UR values. In the preliminary screening trials on budwood nursery plants and in large scale field trials, it was observed that under prevailing climatic conditions in India, mineral oils with low UR values did not cause phytotoxicity on rubber leaves when applied at the low volume rate of 30 to 42 l per ha. The percentage of leaf retention obtained in field trials with low UR value oils was also found to be comparable with leaf retention obtained with diluent mineral oils with UR values of 90% and above. Based on the results of field trials, the spray oil with a UR value of 72%, manufactured locally, was recommended for large scale use in rubber plantations from the 1972 season onwards.

The diluent mineral oil with UR value 90% cost Rs 2.07 per l during the 1970 season whereas the locally processed diluent oil with UR value 72% cost only Rs 1.47 per l in the 1971 spraying season. It was estimated that the rubber plantation industry consumes about 1.5 million l of diluent mineral oil in a season, and the saving on the spraying cost achieved on this account was very significant.

The cost of spraying was steadily rising from 1965 onwards upto 1970, but by the introduction of a 35% oil-based copper, oil dispersible copper oxychloride (56%) in the powder form and low UR value diluent mineral oil, the cost of spraying could be reduced, as shown by the data on the cost of spraying in 1965-1968, 1970 and 1972, given in Table 3.

TABLE 3.

DATA ON SPRAYING COST PER HA IN RUPEES FOR THE YEARS 1965, 1968, 1970 AND 1972

Sl. No.	Method of spraying	Year						
					1972			
		1965	1968	1970	Bordeaux/40% OBC+ 90% UR oil	40% OBC+ 72%UR oil	35% OBC+ 72%UR oil	Oil dispersible COC+ 72%UR oil
1.	High volume Bordeaux mixture	239	356	447	504			
2.	Low volume micron spraying	133	176	219	221	202	186	156
3.	Low volume aerial spraying	187	252	298	300	280	263	242

ACKNOWLEDGEMENT

The authors are thankful to Dr. C. K. N. Nair, Director, Rubber Research Institute of India for the keen interest shown in these experiments and for the valuable guidance received for the preparation of this paper. We are also thankful to M/s. Travancore, Chemical and Manufacturing Co. Ltd., Alwaye, M/s. Tata Fison Industries, Bombay M/s. Indian Oil Corporation Ltd., Madras and M/s. Power Cables Private Ltd., Bombay for supplying the fungicides and diluent oil samples and to many estates and small holdings for giving all facilities for carrying our field trials.

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