Possible Contamination of Latex with Copper Compounds as a Result of Spraying the Trees with Bordeaux Mixture.

Report from the Imperial Institute.

SUBSTANCES containing copper are known to have a harmful effect upon rubber, and recent experiments carried out by the Ceylon Rubber Research Scheme have demonstrated that Bordeaux mixture, if introduced into latex, causes the rubber to become soft and plastic on keeping and to perish quickly when vulcanised (Fourth Quarterly Circular, 1926, p. 13). Even a trace of Bordeaux mixture in the latex has an appreciable effect upon the keeping properties of both the raw and vulcanised rubber.

In these circumstances it was considered desirable in Ceylon to determine whether spraying the crown of the trees with Bordeaux mixture in the usual way is likely to introduce copper into the rubber.

Two series of experiments were carried out to determine this point. In the first no rain fell between spraying and tapping, and the ageing properties of the rubber prepared from latex collected 1 day after spraying were as good as those of a control sample prepared before spraying, showing that no copper from the Bordeaux mixture had entered the latex.

In the second series of experiments, a certain amount of rain fell after spraying and the ageing properties of the rubber prepared 1 and 3 days afterwards were not quite as good as those of the control sample prepared before spraying. The difference between the samples however was not sufficiently marked to suggest the presence of copper compounds. Previous experiments have shown that the smallest amount of copper which can be detected by chemical means has an appreciable effect on the ageing qualities.

The results of the tests, details of which are given below, show that in these experiments spraying the trees with Bordeaux mixture did not introduce sufficient copper into the latex to cause deterioration of the rubber on keeping. It cannot be too strongly emphasised, however, that great care should be exercised in preparing rubber after spraying operations, as the presence of even traces of copper in rubber is detrimental. While the rubber is in the raw state the effect may not become obvious for many months but nevertheless all articles manufactured from such rubber will quickly perish.

Details of Experiments and Results of Tests.

Experiment No. 1.—A control sample of crepe (No. 1269) was prepared from the bulked latex from a group of 100 trees. The trees were sprayed with normal Bordeaux mixture the next day (3 gallons per tree) and a second sample of crepe (No. 1270) was prepared the day after spraying.

Experiment No. 2.—A control sample of crepe (No. 1271) was prepared from a group of 100 trees three days before spraying. The next sample (No. 1272) was prepared the day after spraying; in the interval between spraying and tapping 0·1 inch rain fell. During the next two days 1·1 inch rain fell after which a third sample (No. 1273) was prepared.

On arrival at the Imperial Institute all the samples appeared to be of good quality.

The samples were submitted to plasticity, vulcanising and ageing tests six months after preparation.

The results of the plasticity tests are as follows:—

Table I.

Experiment	Sample No.	Particulars	Time of mastication for power consumption of 450 watt hours	Time of mixing for power consumption of 150 watt hours	Raw Rubber	Masticated Rubber		Mixed Rubber	
					D_{30}*	D_{30}*	Et †	D_{30}*	Et †
			(mins)	(mins)					
1	1269	Control	25½	10½	146	68	35·1	59	24·1
	1270	Prepared 1 day after spraying	25	10½	143	74	41·4	64	31·2
2	1271	Control	24	11	150	70	49·7	63	34·1
	1272	Prepared 1 day after spraying during which 0·1 inch rain fell	26	11	117	69	33·3	60	24·0
	1273	Prepared 3 days after spraying during which 1·2 inch rain fell	26	11	141	66	41·8	61	24·0

*D_{30} = Thickness (in hundredths of a millimetre) of sphere 0·4 grams in weight after pressing in plasticity press at 100°C for 30 minutes.

† Et = Time in minutes required to extrude fixed volume at 90°C.

All the samples, including the controls, are more plastic than the average figures for estate crepe.

In the first experiment, in which no rain fell between spraying and tapping, the crepe prepared after spraying was less plastic than the control. In the second experiment the two samples prepared after spraying are more plastic than the control and it is possible that the rain washed traces of copper on to the tapping surface. The differences in plasticity however are only small.

The following are the results of vulcanising and ageing tests:—

Table II.

Experiment.	Sample No.	Particulars	Time of vulcanisation.	Period of ageing at 70°C.	Tensile Strength	Elongation at load of 1·04 kgs./sq. mm.
			(mins.)	(hrs.)	(lbs /sq in.)	(per cent)
1	1269	Control	120	nil	2130	855
				48	2230	747
				96	1780	712
				144	290	—
	1270	Prepared 1 day after spraying	124	nil	1800	867
				48	2300	750
				96	1900	710
				144	200	—
2	1271	Control	124	nil	2110	853
				48	2200	760
				96	2040	707
				144	290	—
	1272	Prepared 1 day after spraying during which 0·1 inch rain fell	135	nil	1920	840
				48	2300	727
				96	1520	676
				144	260	—
	1273	Prepared 3 days after spraying during which 1·2 inch rain fell	125	nil	2070	841
				48	2330	756
				96	1670	676
				144	280	—

There is no important difference between the vulcanising and ageing properties of any of the samples. Samples 1272 and 1273 are slightly inferior to the control (1271), again suggesting that a trace of copper may have been washed by the rain on to the tapping surface. The difference between the results given by the three samples (1271-1273) however is so small as to be of no practical importance.

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Note added in Ceylon.

The samples referred to above were prepared in connection with a spraying experiment which was carried out under scientific supervision. It was considered desirable by the Technical Committee of the Rubber Research Scheme, that these results should be amplified by tests on rubber from areas sprayed under routine estate conditions. A South Indian Estate has kindly supplied samples for the purpose and these are being forwarded to the Imperial Institute for examination.

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