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Latex Stability and Composition

M. W. PHILPOTT *et alia*

(Rubber Research Institute of Malaya)

Fertiliser treatments have been found to affect the level of mechanical and zinc oxide stability of latices from the plots of a replicated fertiliser trial (seedling rubber) in Field 6 of the R.R.I. Experiment Station. The application of phosphate and potash together has produced a notable increase in stability; nitrogen manuring appears to have had no effect. The experiment provides no information on the effect of applying P & K separately; nor is it certain that the observed effect of PK would be reproducible on other soils since the site of the trial is an exceptionally potash-deficient area.

To test the possibility that the effect of fertilisers on latex stability is correlated with a differential uptake of soil nutrients into the latex system, the plot latices were analysed for nitrogen, phosphorus, potassium and magnesium. Fertiliser treatments were shown to exercise a significant effect on the phosphorus and magnesium contents of the latex, PK manuring tending to raise phosphorus content and lower magnesium content. There is indication, too, that PK manuring raises the potassium content of the latex, although the effect is less obvious.

Effect of PK Manuring on Latex Stability and Composition

Treatment	Latex Composition, parts per 100,000 parts Latex Solids			Mechanical Stability (mins)
	Phosphorus	Potassium	Magnesium	
PK absent -	98.5	407.5	69.0	8.57
PK present -	113.5	434.0	58.5	12.21
s.e. of difference	± 4.2	± 12.9	± 2.7	± .81
Level of Significance of PK effect -	< 1%	almost 5%	< 1%	< 0.1%

As a result of this fertiliser effect in Field 6 it is possible to establish marked negative correlation between

mechanical stability and the magnesium content of the latex (with or without constant phosphorus and potassium content), and marked positive correlation between stability and potassium content (with or without constant phosphorus and magnesium content). Mechanical stability is also positively correlated with phosphorus content but the relation appears to arise because of association between potassium, magnesium and phosphorus content. A significant positive correlation is also demonstrated between mechanical stability and the ratio of phosphorus/magnesium content (with or without constant potassium content).

Following this investigation of latices from seedling rubber, an attempt was made to ascertain whether differences in the stability of clonal latices can be ascribed to differences in their mineral composition. Here it became apparent that other factors conditioning the stability may be present; for whereas latex of the notoriously 'unstable' clone Glenshiel I was found to have low phosphorus and high magnesium content (P/M generally less than 1.0), and latex of 'stable' clones such as P.B.186 and Pil. B.84 had relatively high phosphorus and low magnesium content (P/M_g generally greater than 1.5), latex of clone R.R.I.501 which has sub-normal stability, was found at two estates to have high P/M_g ratio (ca. 2.0).

These observations are tentatively explained by postulating an interaction between phosphate and magnesium ions in ammonia-preserved latex. If the amount of phosphate is insufficient to remove all the magnesium by complexing or precipitation (as in Glenshiel I latex) stability will be impaired by surplus magnesium ions remaining in solution. A considerable excess of phosphate will similarly destabilise the latex as a result of mutual interaction of phosphate anions in solution with charges on the surface of the latex particles. If the phosphorus and magnesium were wholly present in ionic form in the serum the weight ratio required for complete precipitation of both constituents as NH_4MgPO_4 would be 1.35. Thus latices with P/Mg ratio either less than or greatly in excess of some optimum value would tend to be unstable. Such a hypothesis would account plausibly for the observation that latices from plots of clone R.R.I.501 at the R.R.I. Experiment Station—all of which had high P/Mg ratio—exhibit a positive correlation for stability and magnesium content (P & K being constant).