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Short Communications

ENZYME DEPROTEINIZATION OF *HEVEA* LATEX III CLONAL SUITABILITY FOR PAPAIN TREATMENT

P. A. J. YAPA AND W. A. LIONEL

SUMMARY

The latices of 24 Hevea *clones were tested for their suitability for papain treatment. Four of them namely RRIC 39, RRIC 52, RRIC 101 and PB 86, produced latices that were superior for this purpose, with more consistent technological properties and low protein contents together with less seasonal variations in both these characteristics. Clone RRIC 39 was found to be the best all-round clone for enzyme deproteinization with papain.*

INTRODUCTION

A considerable amount of work has been carried out in recent years on deproteinization of NR latex with a view to improving its technological and dynamic properties. Most of the known, commercially available proteolytic enzymes from different sources have been tested on *Hevea* latex for this purpose (Morris 1954), and papain has been found to be the best (Yapa *et. al.* 1978). Preliminary trials carried out in this laboratory with different clones have shown that papain is more effective on some clonal latices than the others. This is of particular importance in view of the need for optimization of papain treatment used in DPNR manufacture. The present investigation was undertaken to study the suitability of several clones for papain treatment and to obtain the maximum deproteinization together with improved characteristics. Only the clones with the least amount of seasonal variation, which is undesirable, were used.

EXPERIMENTAL

Latex samples were collected from the Institute's Estate at Dartonfield and also from Eladuwa Estate, Paiyagala. White papain was used in all enzyme treatments at 0.05% on latex. Nitrogen content was determined by the Micro-Kjeldahl method.

RESULTS AND DISCUSSION

The protein contents in the dry rubber of the 24 clones investigated in this study are given in Table 1, arranged in the decreasing order of protein content. The clones giving the greatest reduction in protein content (see Table 1) when compared with acid coagulation, were not the same as those with the lowest protein content, which were PB 86, RRIC 39, RRIC 101, TR 1542, G. T. 1, and RRIC 100.

The popular clones for planting: PB 86, RRIC 39, RRIC 52, RRIC 100, RRIC 101 and RRIM 600 were selected for the study on seasonal variation. Monthly variation in protein content after papain treatment is given in Table 2. Clones RRIM 600 and RRIC 100 showed a marked seasonal variation of over 1.2% in protein content. The other clones tested had a more uniform protein content through the year (Table 2).

Seasonal variation of some of the raw rubber properties was also studied. The monthly variation of Plasticity Retention Index (PRI) of six clones is given in Fig. 1. The PRI was found to be low during the wintering period, but recovered considerably during the months of February - July, in all six clones examined. Seasonal variation of Wallace Plasticity (Po) is given in Fig. 2. No significant pattern in the variation of Po was noticed except that the Po of papain treated rubber of all six clones was found to be higher than those of the acid coagulated controls. The increase in Po of papain treated rubber has now been established (Yapa and

TABLE I. Protein content (%) of acid & papain treated rubbers

Clone		*Acid*	*Papain*	*Treatment* *% Reduction in protein content*
RRIC	101	2.59	0.96(3)	62.93
TR	1542	2.50	0.96(3)	61.60
RRIC	100	2.66	1.03(6)	61.27
RRIC	39	2.21	0.89(2)	59.72
G.T.	1	2.47	1.02(5)	58.70
RRIM	600	2.80	1.16	58.57
PR	254	2.68	1.12(10)	58.20
RRIC	60	2.50	1.07(8)	57.20
RRIC	112	2.35	1.03(6)	56.17
AV	2037	2.45	1.09(9)	55.51
PB	86	1.93	0.86(1)	55.44
IR	6	2.82	1.31	53.54
RRIM	623	2.54	1.19	53.15
AV	1734	2.47	1.19	51.82
RRIC	41	2.42	1.24	48.76
WR	101	2.42	1.24	48.76
RRIC	103	2.52	1.31	48.01
NAB	12	2.89	1.51	47.75
RRIC	28	2.31	1.26	45.45
RRIC	89	2.22	1.24	44.14
RRIC	7	2.24	1.26	43.75
RRIC	45	2.13	1.21	43.19
PB	59/28	1.84	1.12	39.13

(mean of ten different determinations, numbers in ( ) indicate the first ten lowest protein contents).

TABLE 2. Seasonal effect on deproteinization of *Hevea* latex with papain

Clone		*Month*/ protein content(%)*											
		J	*F*	*M*	*A*	*M*	*J*	*J*	*A*	*S*	*O*	*N*	*D*
RRIM	600	1.75	1.28	0.88	1.18	1.28	1.25	1.19	1.07	1.31	1.25	1.46	1.84
RRIC	101	1.60	1.14	0.93	1.23	1.31	1.14	1.19	1.08	0.96	1.23	1.14	1.37
PB	86	1.11	0.99	1.14	1.83	1.31	1.23	1.19	1.05	1.05	1.05	1.05	1.02
RRIC	39	1.05	0.93	1.08	1.18	1.23	1.14	1.23	1.05	0.96	1.05	1.02	1.08
RRIC	100	1.05	1.31	1.51	1.21	1.25	1.37	1.40	1.37	1.31	1.49	1.19	1.72
RRIC	52	1.08	1.25	1.28	1.21	1.18	1.19	1.19	1.08	1.23	1.05	1.16	1.31

*1978—1979, Experiment carried out at Eladuwa & Dartonfield Estates.

TABLE 3. Raw rubber and vulcanizate properties of the 4 selected clones

	PB 86	*RRIC 39*	*RRIC 52*	*RRIC 101*
Raw rubber properties				
Po	57	58	51	60
PRI	61	75	67	70
Nitrogen % wt.	.14	.14	.13	.15
Ash % wt.	.26	.24	.17	.20
Viscosity ML (1+4) 100°C	76	81	77	78
*Curing characteristics**				
Minimum Torque d N°m	15.5	13.5	13.3	8.5
Equilibrium torque d N°m	90.8	86.0	85.3	81.0
Scorch time min	3.75	3.75	4.25	3.75
Cure time (90%) min	27.25	25.0	23.50	23.50
Cure rate index	4.25	4.7	5.2	5.1
*Physical properties**				
Tensile strength kg/cm^2	255.8	295.9	258.9	277.8
Modulus at 100% kg/cm^2	24.2	27.0	22.6	22.8
Modulus at 300% kg/cm^2	131.2	136.5	122.5	138.8
Elongation at break %	450	500	500	475
Hardness IRHD	65.8	65.0	63.0	68.0
Resilience	62.0	63.5	64.0	63.0

* filled compound.

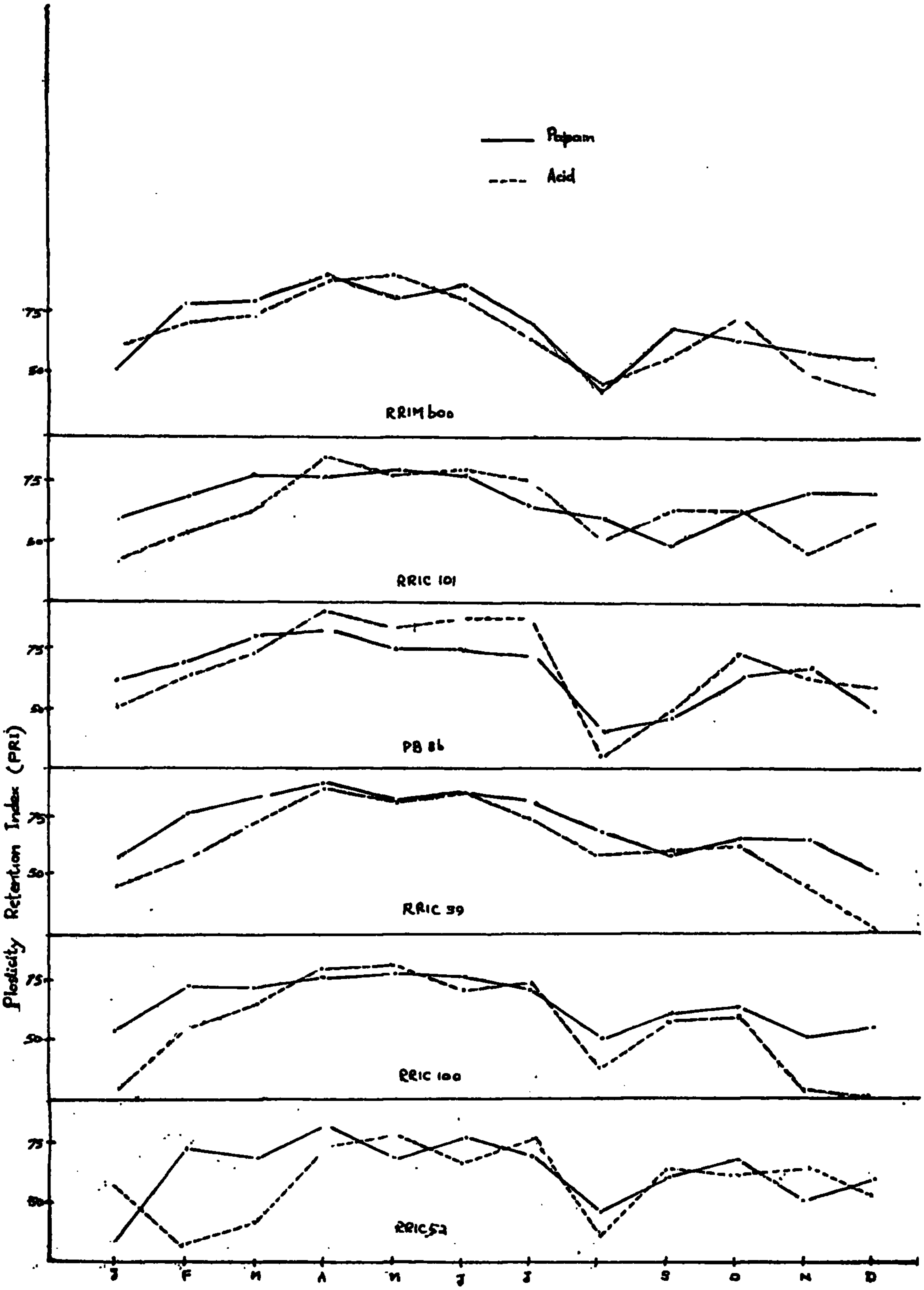

Fig 1. Seasonal variation in PRI.

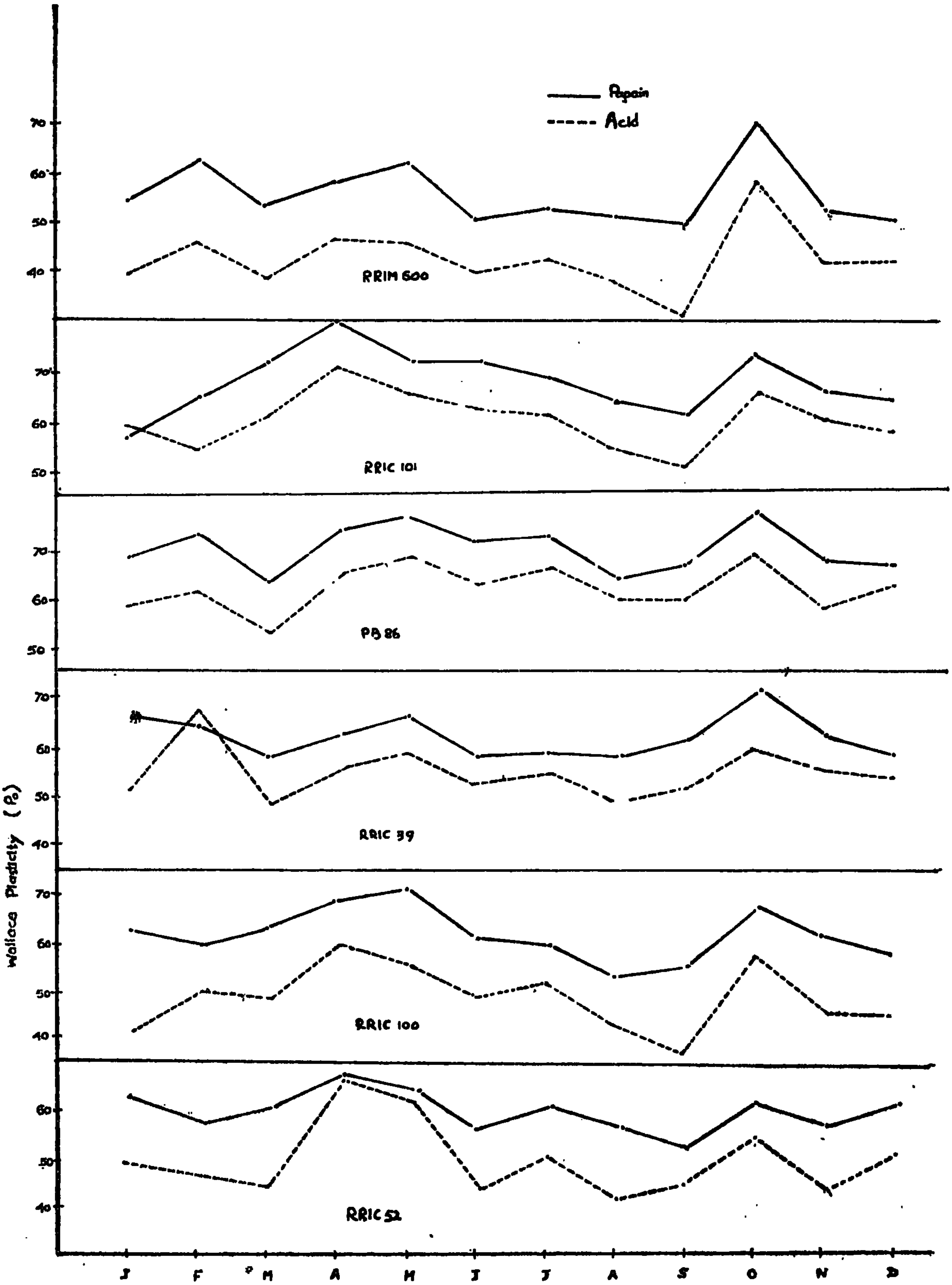

Fig 2. Seasonal variation in Po.

Lionel, 1979). Amino acids have been reported (Gregory & Tan, 1975) to have an effect on hardening of *Hevea* rubber on storage and the increase in Po of papain treated rubber can be attributed to free amino acids present in the dried papaw milk which is generally used as the source of papain.

Raw rubber properties as well as the physical properties (filled compound) of the 6 clones studied were found to be satisfactory (Table 3). Clones RRIC 39, and RRIC 101 exhibited the best tensile strength properties.

With its desirable characteristics such as the least seasonal variations, very low protein content, the greatest resistance to oxidation and the best tensile strength properties, RRIC 39 appears to be the most suitable clone of those tested, for enzyme deproteinization of *Hevea* latex, using papain. On the basis of yields however RRIC 39, has not gone into commercial planting; but on the results of this study, its potential as a parent clone in breeding programmes is obvious.

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