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Studies on the influence of various latex yield stimulants on dry rubber content and cup lump weight in *Hevea brasiliensis*

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Abstract

The influence of several latex yield stimulants on dry rubber content (DRC) and cup lump weight in *Hevea brasiliensis* was studied at Rubber Research Institute of Nigeria, Iyanomo, Benin City. The NIG 805 clone was used for the study which is grown in the clonal garden of the Institute. Four different stimulants namely: Mortex 50, Mortex 25, Vitex and Ethephone were used for the study. The experiment comprised five different treatments (the four stimulants and the control) in three replicates of three trees each, making a total of forty-five trees. The duration of the study was three months and stimulation was done once monthly. The trees were tapped using the ½S, d/2 tapping mode and the latex flow time for each tree was two hours. Data collected include; volume of latex collected two hours after tapping, dry rubber content (DRC) and weight of cup lump. Results were analysed using ANOVA and they showed a significant difference in DRC of the stimulated trees with the control trees having the highest DRC and the Mortex 50 treated trees having the highest cup lump weight. The results are further discussed

Keywords: *Hevea brasiliensis*, latex, stimulant, cup lump, dry rubber content (DRC)

Introduction

The rubber tree (*Hevea brasiliensis* Muell. Arg.) is globally and economically important because of the latex (which gives natural rubber) it produces from its laticiferous cells [1]. Extraction of this latex which is about 30 - 40% rubber from the Hevea tree is done by a multi-annual systematic tapping of its bark which may continue for up to 30 years. The efficiency of the tapping system is a very important factor in latex production of the *Hevea* tree. This has culminated in the development of low frequency tapping systems, but with enhanced yield [2, 3, 4, 5, 6] resulting from the use of stimulants. Stimulants are chemical substances which have been known to increase latex yield by delaying the plugging of the cut laticiferous cells. This in turn reduces tapping frequency and increases land or labor productivity [7, 8, 9, 10, 11, 12]. Latex yield from each tapping is dependent on a complexity of factors which could be either internal or external. The internal factors are related to the clone and age of the tree, while the external factors include the tapping system in use, stimulation, the depth, slope and length of the tapping cut [11, 12, 14]. Latex yield is also dependent on the flow rate, plugging index as well as the dry rubber content [1].

The dry rubber content (DRC) of latex is the actual rubber composition in the liquid latex. Latex is composed of both rubber and non-rubber solids such as proteins, resins, sugars, ash and steryl glycosides [15], but it is the DRC that is of utmost importance in the latex. Cup Lump on the other hand is the crepe rubber produced from the dried films and lumps of rubber found in the tapping cups at the beginning of the next

tapping. It can be added to the latex for coagulation or gathered separately. It can also be used in the determination of the yield of the tree.

The latex collected can either be used in the liquid form for the production of hand gloves condoms e.t.c., or be coagulated in cups/pans which is then processed into tyres, tubes e.t.c. The latex is a mixture of rubber and non-rubber particles (carbohydrates, proteins, lipids and inorganic salts) in aqueous serum [16].

The objective of the study was therefore to determine the probable effect of an array of stimulants on the DRC and cup lump in *Hevea brasiliensis*.

2. Materials and Method

The study was done at the Rubber Research Institute of Nigeria, Iyanomo, Nigeria. The experiment was set out in the Clonal garden of the Institute in a randomised complete block design. The trees used for the experiment was one of the RRIN developed clone - NIG 805 and the plantation was established in 1991. A total of forty-five (45) trees were used for the experiment. This comprised 5 different treatments (with four different stimulants) in three replicates. The treatments were mortex 25, mortex 50, vitex, ethephon and the control. Each treatment comprised of 3 trees. Stimulation was done once monthly and the trees were tapped using the ½S, d/2 tapping method. Tapping and data collection was carried out over a three month period. Data collected include volume [ml] of latex collected in two hours of flow after tapping, dry rubber content (DRC) and weight of cup lump. Dry rubber

content was determined using the Metrolac. The latex flow time for each tree was two hours and results were analysed using Analysis of Variance (ANOVA).

3. Results and Discussion

Stimulants have been shown to enhance latex yield in *Hevea* trees [17]. It has also been used to reduce labour cost in plantations. These stimulations may however affect latex physiology [18]. This study showed there were some variations in the DRC of the experimental trees (Fig 1).

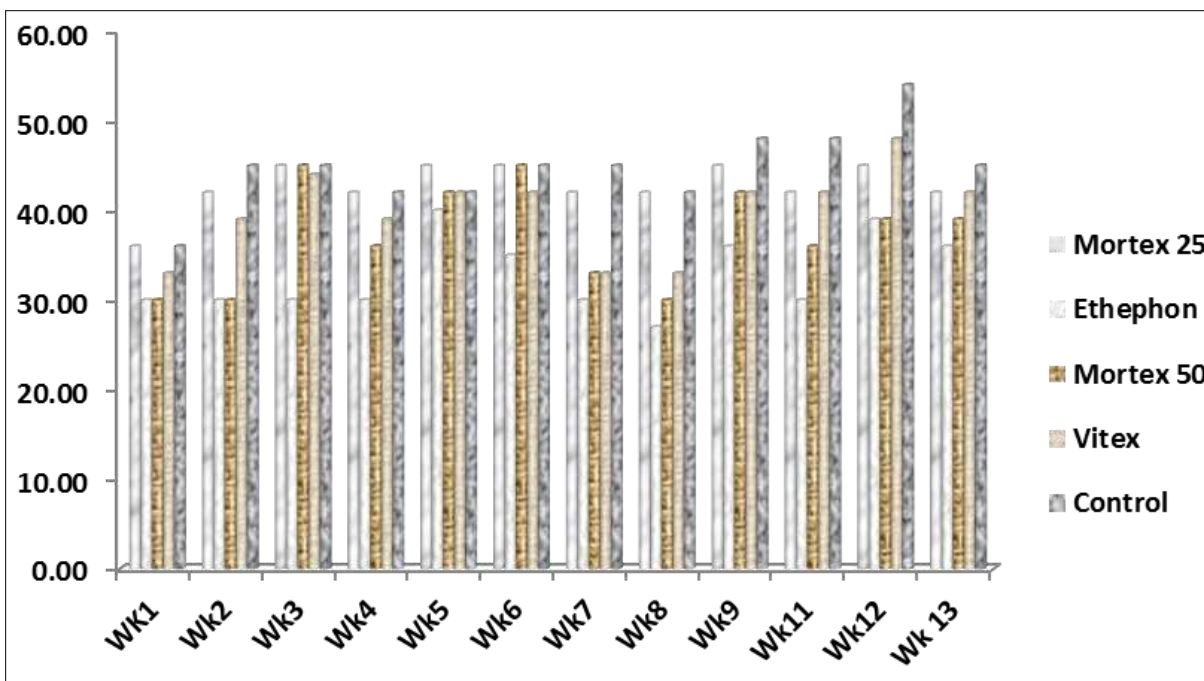


Fig 1: Dry rubber content of the experimental trees

There was an observed difference in the DRC as a result of the treatment (Table 1a) and an LSD test showed that the control trees which were not stimulated had DRC which was significantly different from the stimulated trees (Table 1b). The control trees also had the highest DRC.

Table 1a: Analysis of variance of mean dry rubber content (DRC %) of latex.

Source of Variation	df	SS	MS	F
Week	11	717.38	65.22	7.78
Treatment	4	1056.57	264.14	31.49*
Error	44	369.03	8.39	
Total	59	2142.98		

p<0.05: * means significant difference in dry rubber content of latex produced

Table 1b: Mean separation of the Rubber Content (DRC %) of latex produced.

Stimulant	Mean DRC (%)
Control	44.50 ^a
Mortex 25	43.00 ^b
Vitex	39.92 ^c
Mortex 50	37.25 ^d
Ethephone	32.75 ^e

LSD 1.49

The stimulation increases invertase activity, sucrose content and stability of latex A 1989 study by Paardekooper, has shown that DRC decreases by between two to seven percent

as the balance between rubber biosynthesis and extraction is shifted to a lower equilibrium as a result of stimulation [19]. while decreasing starch content of bark [20]. It however has no effect on rubber properties [21]. The highest cup lump weights on the other hand, were obtained from the trees stimulated with mortex 50 and mortex 25 (Fig 2), indicating that the latex flow obviously continued for a longer time in the mortex stimulated trees.

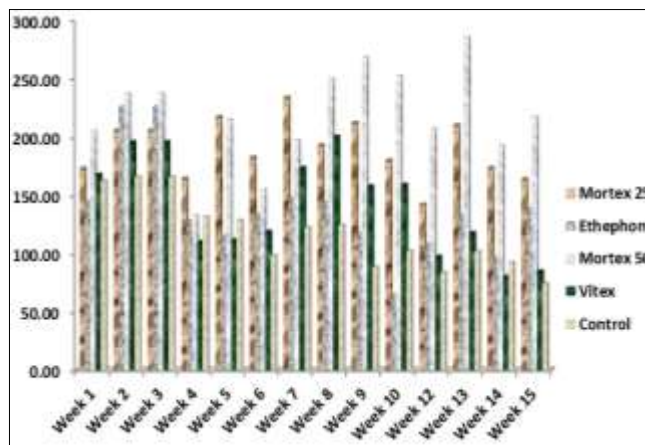


Fig 2: Weight of cup lump of the experimental trees

An analysis of variance on the cup lump weights showed that there was a significant difference in the weights due to the treatment (Table 2a). The cup lump weights of the mortex 50,

mortex 25 and vitex stimulated trees were significantly different from the control (Table 2b). This is in consonance with reports of [18] that stimulation increases production in *Hevea* trees.

Table 2a: Analysis of variance of mean weight of cup lump (g) of latex.

Source of Variation	Df	SS	MS	F
Week	125	3747235.00	29977.88	1.89
Treatment	4	876203.50	219050.90	13.85*
Error	500	7908144.00	15816.29	
Total	629	12531583.00		

$p \leq 0.05$: * means significant difference in weight of cup lump of latex produced

Table 2b: Mean separation of the weight of cup lump (g).

Stimulant	Mean weight of cup lump
Mortex 50	217.77 ^a
Mortex 25	190.39 ^{ab}
Vitex	141.21 ^{bc}
Ethephone	137.19 ^{bc}
Control	117.3 ^c

LSD 60.11

Although this study showed an increase in latex production, as the cup lump weight in the stimulated trees was higher, it did not translate to an increase in the dry rubber content (DRC). A higher cup lump weight is also indicative of increased yield in the trees.

4. Conclusion

From the foregoing, it is clear that stimulation has a negative effect on DRC. It however increases weight of cup lump which translates to an increase in yield. The rubber farmer should therefore determine what he needs, before going ahead to stimulate his trees.

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