INFLUENCE OF AGE AND GIRTH AT OPENING ON RUBBER YIELD, BIOCHEMICAL AND TAPPING PANEL DRYNESS PARAMETERS OF HEVEA BRASILIENSIS IN DETERMINING TAPPING NORMS

INTRODUCTION

• The tapping of rubber tree creates a significant antagonism between the vegetative growth and rubber yield of the tree (Wycherley, 1976).

• The girth of trees at the opening is decisive and the low increase in girth during tapping is an indicator of low vegetative growth and physiological immaturity of rubber trees (Obouayeba et al., 2002).
INTRODUCTION

• The girth at the opening up was right from the beginning the only empirical criterion to start tapping the rubber trees (Compagnon, 1986).

• It consists in tapping the rubber trees when their girth measured at 1 m above the ground reaches 50 cm.

INTRODUCTION

• This study aims at analyzing and determining the effect of the girth or the time of opening, on the biochemical parameters of latex and those of rubber yield and tapping panel dryness of three Hevea brasiliensis clones, PB 235, GT 1 and PB 217, in rubber growing area in south Côte d'Ivoire.
MATERIALS ET METHODS

Plant materials
The plant materials used are clones PB235, GT1 and PB217 of Hevea brasiliensis.

The metabolic activity and the vegetative growth of these clones were respectively fast, moderate and slow.

MATERIALS ET METHODS

Methods
Experimental designs
Experimental design: One tree plot design (33 trees/treatments).
Clones: PB 235, PB 217 and GT 1.
Density of planting: 510 trees/ha.
Trials area: 3.12 ha.
Tapping: S/2 d4 6d/7.
MATERIALS ET METHODS

Methods

Treatments
Clone PB 235: six treatments (control untapped and five girths at opening, 40, 45, 50, 55 and 60 cm).
Clone PB 217: four treatments (opening at 50, 55, 60 and 65 cm girth).
Clone GT 1: six treatments (control untapped and five girths at opening, 30, 35, 40, 45, 50 cm).

MATERIALS ET METHODS

Methods

Studied parameters
Rubber yield
The yield was recorded tree by tree, every four weeks.
The yield was expressed in g/t/t and g/t/y.
MATERIALS ET METHODS

Methods
Studied parameters
Tapping panel dryness (TPD)
The parameters used were: Dry cuts (Van de Sype, 1984) and dry trees.

MATERIALS ET METHODS

Methods
Studied parameters
Physiological parameters
The dry rubber rate and the sucrose, inorganic phosphorus and thiols contents were assessed according to the method of latex microdiagnosis (JACOB et al., 1988).
MATERIALS ET METHODS

Methods

Studied parameters

Statistical analysis

Data were subject to an analysis of variance (\(\alpha = 5\%\)) with STATGRAPHICS® statistical software.

RESULTS AND DISCUSSION

Rubber yield

Table 1. Rubber yield of clone GT 1 during 10 years of experiment

<table>
<thead>
<tr>
<th>Treatments</th>
<th>g/t/t (average)</th>
<th>g/t/y (cumulative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 : Opening at 30 cm girth or at 3 years 5 months</td>
<td>23.1 d</td>
<td>24 903 b</td>
</tr>
<tr>
<td>T2 : Opening at 35 cm girth or at 3 years 10 months</td>
<td>25.3 cd</td>
<td>26 061 b</td>
</tr>
<tr>
<td>T3 : Opening at 40 cm girth or at 4 years 4 months</td>
<td>29.2 bc</td>
<td>28 500 a</td>
</tr>
<tr>
<td>T4 : Opening at 45 cm girth or at 4 years 9 months</td>
<td>31.7 ab</td>
<td>29 705 a</td>
</tr>
<tr>
<td>T5 : Opening at 50 cm girth or at 5 years 9 months</td>
<td>33.9 a</td>
<td>29 829 a</td>
</tr>
</tbody>
</table>

Treatments assigned with the same letter were not significantly different (Scheffe test at 5%). Treatments are tapped at the same frequency i.e. 5/2 d4 6d/7, that is, 78 tappings/year.
RESULTS AND DISCUSSION

Rubber yield

Table 2. Rubber yield of clone PB 217 during 11 years of experiment

<table>
<thead>
<tr>
<th>Treatments</th>
<th>g/t/t (average)</th>
<th>g/t/y (cumulative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 : Opening at 50 cm girth or at 6 years 10 months</td>
<td>69.7 c</td>
<td>58 794</td>
</tr>
<tr>
<td>T2 : Opening at 55 cm girth or at 7 years 4 months</td>
<td>78.2 b</td>
<td>62 376</td>
</tr>
<tr>
<td>T3 : Opening at 60 cm girth or at 8 years 3 months</td>
<td>84.2 b</td>
<td>62 666</td>
</tr>
<tr>
<td>T4 : Opening at 65 cm girth or at 8 years 10 months</td>
<td>88.8 a</td>
<td>61 290</td>
</tr>
</tbody>
</table>

Treatments assigned with the same letter were not significantly different (Scheffe test at 5%). Treatments are tapped at the same frequency i.e. S/2 d4 6d/7, that is, 78 tappings/year.

RESULTS AND DISCUSSION

Rubber yield

Table 3. Rubber yield of clone PB 235 during 8 years of experiment

<table>
<thead>
<tr>
<th>Treatments</th>
<th>g/t/t (average)</th>
<th>g/t/y (cumulative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening at 40 cm girth or at 4 years 11 months</td>
<td>40.0 b</td>
<td>24 500 a</td>
</tr>
<tr>
<td>Opening at 45 cm girth or at 5 years 3 months</td>
<td>42.1 b</td>
<td>24 505 a</td>
</tr>
<tr>
<td>Opening at 50 cm girth or at 6 years 3 months</td>
<td>50.8 a</td>
<td>25 607 a</td>
</tr>
<tr>
<td>Opening at 55 cm girth or at 7 years</td>
<td>54.0 a</td>
<td>23 992 ab</td>
</tr>
<tr>
<td>Opening at 60 cm girth or at 7 years 6 months</td>
<td>53.8 a</td>
<td>21 958 b</td>
</tr>
</tbody>
</table>

Treatments assigned with the same letter were not significantly different (Scheffe test at 5%). Treatments are tapped at the same frequency i.e. S/2 d4 6d/7, that is, 78 tappings/year.
RESULTS AND DISCUSSION

Physiological profile

Fig. 1: Physiological profile of clone GT 1 during 10 years of experiment

Treat. 1: opening at 30 cm of girth
Treat. 2: opening at 35 cm of girth
Treat. 3: opening at 40 cm of girth
Treat. 4: opening at 45 cm of girth
Treat. 5: opening at 50 cm of girth
Control: untapped

Fig. 2: Physiological profile of clone PB 217 during 11 years of experiment

Treat. 1: opening at 50 cm of girth
Treat. 2: opening at 55 cm of girth
Treat. 3: opening at 60 cm of girth
Treat. 4: opening at 65 cm of girth
RESULTS AND DISCUSSION

Physiological profile

Fig. 3: Physiological profile of clone PB 235 during 8 years of experiment

Treatments Dry cuts (%) Dry trees (%)
T1: Opening at 30 cm girth or at 3 years 5 months 26.6 a 1.4 d
T2: Opening at 35 cm girth or at 3 years 10 months 25.1 a 8.9 a
T3: Opening at 40 cm girth or at 4 years 4 months 19.5 b 5.6 b
T4: Opening at 45 cm girth or at 4 years 9 months 17.7 b 3.4 c
T5: Opening at 50 cm girth or at 5 years 9 months 14.1 c 3.2 c

Treatments assigned with the same letter were not significantly different (Scheffe test at 5%). Treatments are tapped at the same frequency i.e. $S/2 d4 6d/7$, that is, 78 tappings/year.
RESULTS AND DISCUSSION

Tapping panel dryness

Table 5. Dry cuts and dry trees rates of clone PB 217 during 11 years of experiment

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Dry cuts (%)</th>
<th>Dry trees (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 : Opening at 50 cm girth or at 6 years 10 months</td>
<td>0.0 c</td>
<td>0.0 c</td>
</tr>
<tr>
<td>T2 : Opening at 55 cm girth or at 7 years 4 months</td>
<td>10.0 ab</td>
<td>3.2 b</td>
</tr>
<tr>
<td>T3 : Opening at 60 cm girth or at 8 years 3 months</td>
<td>11.9 a</td>
<td>6.5 a</td>
</tr>
<tr>
<td>T4 : Opening at 65 cm girth or at 8 years 10 months</td>
<td>8.3 b</td>
<td>6.7 a</td>
</tr>
</tbody>
</table>

Treatments assigned with the same letter were not significantly different (Scheffe test at 5%). Treatments are tapped at the same frequency i.e. S/2 d4 6d/7, that is, 78 tappings/year.

RESULTS AND DISCUSSION

Tapping panel dryness

Table 6. Dry cuts and dry trees rates of clone PB 235 during 8 years of experiment

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Dry cuts (%)</th>
<th>Dry trees (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening at 40 cm girth or at 3 years 5 months</td>
<td>5.0</td>
<td>0</td>
</tr>
<tr>
<td>Opening at 45 cm girth or at 3 years 10 months</td>
<td>8.8</td>
<td>3.1</td>
</tr>
<tr>
<td>Opening at 50 cm girth or at 4 years 4 months</td>
<td>10.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Opening at 55 cm girth or at 4 years 9 months</td>
<td>6.9</td>
<td>3.1</td>
</tr>
<tr>
<td>Opening at 60 cm girth or at 5 years 9 months</td>
<td>6.4</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Treatments assigned with the same letter were not significantly different (Scheffe test at 5%). Treatments are tapped at the same frequency i.e. S/2 d4 6d/7, that is, 78 tappings/year.
RESULTS AND DISCUSSION

• Our results have shown that early tapping reduced rubber yield.
• The competition vegetative growth-rubber yield is important especially as the tapping is early (Templeton, 1969, Wycherley, 1976, Obouayeba, 2005).
• However, when the tapping is performed at the age of 6 years after planting, the functioning of the couple vegetative growth-rubber yield is good (Premakumari et al., 1996).

RESULTS AND DISCUSSION

• The low rate of TPD shown the trees reinforces this thesis which is also corroborated by a good balance of the physiological profile, with no signs of physiological fatigue (Jacob et al., 1994; Obouayeba et al., 1996).
RESULTS AND DISCUSSION

• The best compromise, concerning the different girths at the opening is obtained for openings at 50 cm on clones GT 1, PB 217 and PB 235.
• The periods or corresponding ages, in relation to planting, ranged from 5 years 9 months and 6 years 10 months, all clones combined.

RESULTS AND DISCUSSION

• Six years after planting, the behaviour of Hevea brasiliensis was not dependent on the girth at opening.
• Six ears after planting, the Hevea brasiliensis has actually reached an latex harvesting maturity which reflects a physiological maturity.
CONCLUSION

• The experiments relating to the impact of several girths or tapping start period on the agronomic performance of some clones of *Hevea brasiliensis* show that the tapping start at 50 cm girth for clones GT 1, PB 217 and PB 235 are the best treatments in terms of rubber yield, physiological profile and sensitivity to TPD.

CONCLUSION

• The different periods corresponding to those tapping start girths have enabled to notice that they were reached about six years after planting, regardless of the vegetative growth class of the clone.
• Considering the growth retardation, the preponderance of the notion of opening age over opening girth can be admitted.
CONCLUSION

• The age of 6 years after planting seems to be the best tapping start period of rubber trees, because it is invariable for the three classes of vegetative growth of the clones studied and can be a strong marker of physiological maturity in *Hevea brasiliensis*.

THANK YOU

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