First Tests of “Double Cut Alternative” Rubber Tapping System in Southern Thailand

Sayan Sdoodee1*, Antoine Leconte2, Sopon Rongsawat1, Jureerat Rukkhun1, Thanaporn Huaynui1 and Hataikan Chinatiam1

ABSTRACT

In southern Thailand, rubber smallholders normally use very intensive tapping systems. This may result in overexploitation, high tapping panel dryness rates and a short production lifespan with low productivity. A “double cut alternative” (DCA) tapping system was tested in Songkhla province, a traditional rubber production area. The aim of the DCA system is to optimize high tapping frequencies by splitting tapping between two different cuts tapped alternately to increase the latex regeneration time in the bark. An on-station trial was started in 2007 at the Thepa Research Station, Songkhla province. The experiment used a “one tree plot design” comprising 20 replicates per treatment with four different treatments in a plot planted in 1999 with the rubber clone RRIM 600. During the first three years of tapping, the DCA treatment T2 led to a 22% increase in yield (kg tree\(^{-1}\)) compared with its control (T1). The DCA treatment T4 led to a 16% increase in yield compared with its control (T3). Output per tapping (g tree\(^{-1}\) tapping\(^{-1}\)) in the DCA treatments also increased. There was no adverse impact on radial trunk growth, but the two DCA tapping systems led to a 13–19% increase in bark consumption. The results of the on-station trials using the DCA tapping systems were promising, but on-farm trials with farmers in different areas in southern Thailand are needed before this technique can be recommended at a larger scale.

Keywords: DCA tapping system, Hevea brasiliensis, RRIM 600, Southern Thailand, yield

INTRODUCTION

The continuous decrease in the size of Thai smallholder rubber plantations has led to the widespread use of very intensive tapping systems that may result in overexploitation, high rates of tapping panel dryness, short life cycles of the plantations and reduced productivity (Silpi et al., 2006; Chanui et al., 2007). Following the promising results of on-station trials at the Chachoengsao Rubber Research Centre (Gohet and Chantuma, 2003a, 2003b; Chantuma and Gohet, 2007; Chantuma et al., 2011), and an on-farm trial in eastern Thailand (Vaysse et al., 2006; Kruprasert et al., 2007; Leconte et al., 2007), it was necessary to test the DCA tapping system under different soil and climatic conditions, specifically in southern Thailand where traditionally, rubber

1 Department of Plant Science, Faculty of Natural Resources, Prince of Songkla University, Hat Yai, Songkhla 90112, Thailand.
2 CIRAD-UPR Tree Crop-Based Systems, DORAS Platform, Research and Development Building, Kasetsart University, Bangkok 10900, Thailand.
* Corresponding author, e-mail: sayan.s@psu.ac.th

Received date : 08/08/11 Accepted date : 20/01/12
has been produced. The purpose of the experiment was to analyze the results, feasibility and future prospects of the DCA tapping system in southern Thailand to improve the productivity of Thai rubber plantations. It is hoped that information from this study will lead to practical recommendations for Thai rubber smallholders and plantation managers to improve the productivity of the rubber fields.

MATERIALS AND METHODS

The on-station experiment was conducted at the Thepa Research Station, Thepa district (N 6°47′, E 100°56′). The experiment was designed as a “one tree plot design” (OTPD) comprising 20 replicates per treatment. There were four treatments (T1–T4), according to the Revised International Notation for Latex Harvest Technology (Vijayakumar et al., 2009) as follows:

\[
\begin{align*}
T1 & = S/2 \ d2 \ 7d/7 \\
T2 & = DCA: 2 \times S/2 \ d4 \ 7d/7 \ (t,t) \\
T3 & = S/3 \ d1 \ 3d/4 \ 7d/7 \\
T4 & = DCA: 2 \times S/3 \ d2,d3 \ 7d/7 \ (t,t)
\end{align*}
\]

There was no ethephon and ethylene stimulation in any treatment. The trees under trial were planted in 1999 (spacing of 7 × 3 m; 476 trees ha\(^{-1}\)) and selected before the first tapping for homogenous girth inside a monoclonal RRIM 600 plot. The soil texture was sandy loam with pH 5.5 (Coated, isohyperthermic, Typic Quartzipsamments). The tapping systems were implemented from 7 May 2007. One single tapper was in charge of the whole experimental plot. The S/2 d2 7d/7 (T1) and S/3 d1 3d/4 7d/7 (T3) treatments were opened on panel B0-1 at a height of 1.50 m from the ground. The double cut treatments DCA: 2 × S/2 d4 7d/7 (t,t) (T2) and DCA: 2 × S/3 d2,d3 7d/7 (t,t) (T4) were opened simultaneously on panel B0-1 at a height of 0.80 m from the ground and on panel B0-2 at a height of 1.50 m from the ground. The schedule of panel management during the tapping period of 2007–2010 is shown in Figure 1.

The latex yield was collected from cup lumps. The studied parameters were dry rubber production (kg tree\(^{-1}\) year\(^{-1}\), g tree\(^{-1}\) tapping\(^{-1}\)), girth (measured at 1.70 m height from the ground) and bark consumption.

Figure 1  Management of tapping panels (B0-1, B0-2, B0-3) during the first three years (Y1-Y3) of tapping. (T1 = S/2 d2 7d/7; T2 = DCA: 2 × S/2 d4 7d/7 (t,t); T3 = S/3 d1 3d/4 7d/7; T4 = DCA: 2 × S/3 d2,d3 7d/7 (t,t))
RESULTS AND DISCUSSION

Tapping frequencies currently used by smallholders can be as often as daily. Since latex regeneration between two consecutive tappings is the main limiting factor for latex production, yield in Thailand is high when expressed in kg.ha⁻¹ but low when expressed in kg.tapper⁻¹.day⁻¹. With DCA, by splitting these high tapping intensities into two different cuts tapped alternately, the time for latex regeneration is doubled at each cut, which is theoretically expected to increase the output per tree and per tapping.

Rubber yield per year

Table 1 presents the yearly rubber yield obtained during the first three years of tapping and the cumulative yield from year 1 to year 3 expressed in kg tree⁻¹. Compared to its control treatment (T1), T2 led to a 22% increase in yield. Compared with its control treatment (T3), T4 led to a 16% increase in yield. These results showed that for the clone RRIM 600, DCA enabled a significant improvement in yield with no need for stimulation as already reported by Gohet and Chantuma (2003a). The positive effect of the DCA tapping system is assumed to be related to the longer latex regeneration time between the two consecutive tappings.

Growth

Figure 2 shows that there was no significant difference in trunk radial growth among the four treatments during the first three years of tapping. Gohet and Chantuma (2003a) also reported that there was no adverse impact of the DCA tapping system on trunk radial growth in rubber trees. However, in the current experiment with DCA tapping systems, trunk radial growth tended to be slightly lower. This might have been due to competition for biomass between the growth and latex regeneration sinks, as DCA significantly increased the yield compared to the controls.

Bark consumption

Figure 3 shows that after three year of tapping, T2 (DCA: 2×S/2 d4 7d/7 (t,t)) led to a 19% increase in bark consumption compared with its control T1 (S/2 d2 7d/7). Similarly, with T4 (DCA: 2×S/3 d2,d3 7d/7 (t,t)), bark consumption was 13% higher than that of its control T3 (S/3 d1 3d/4 7d/7). These results were due to more bark being consumed during tapping, especially with low cuts under the DCA tapping system, because, in southern Thailand, the tapper normally bends down and presses the tapping knife or “jebong” harder into the low cut (Huaynui, 2009). However, it may be possible to lessen this undesirable effect by specific training of the tapper. The current

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Cumulated cup lump</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kg t⁻¹</td>
<td>%</td>
<td>kg t⁻¹</td>
<td>%</td>
</tr>
<tr>
<td>T1 = S/2 d2 7d/7</td>
<td>4.05a</td>
<td>100</td>
<td>2.69c</td>
<td>100</td>
</tr>
<tr>
<td>T2 = DCA: 2×S/2 d4 7d/7 (t,t)</td>
<td>4.90c</td>
<td>121</td>
<td>3.27ab</td>
<td>122</td>
</tr>
<tr>
<td>T3 = S/3 d1 3d/4 7d/7</td>
<td>5.16b</td>
<td>100</td>
<td>3.04b</td>
<td>100</td>
</tr>
<tr>
<td>T4 = DCA: 2×S/3 d2,d3 7d/7 (t,t)</td>
<td>6.09a</td>
<td>118</td>
<td>3.50a</td>
<td>115</td>
</tr>
</tbody>
</table>

*Means with the same lowercase letter in each column are not significantly different (P ≤ 0.05) by Duncan’s multiple range test.
results confirmed the efficiency of the DCA system in increasing yield potential and labor productivity. Thus, it should be possible to use the DCA tapping system in Songkhla province, particularly for the RRIM 600 clone. The other benefit of the DCA system is that the rubber smallholders do not need to use growth stimulators, and thus avoid the additional cost. Further, they will be able to use the DCA tapping system on their farms with no change in their tapping frequency compared to a conventional tapping system. In other words, the tapping intensity will be shared between two cuts tapped alternately instead of using a single cut in the equivalent conventional systems. However, the

Figure 2 Trunk radial growth (1.70 m height from the ground) for the four treatments after the first three years of tapping. (T1 = S/2 d2 7d/7; T2 = 2 × S/2 d4 7d/7 (t, t); T3 = S/3 d1 3d/4 7d/7 and T4 = 2 × S/3 d2,d3 7d/7 (t, t). Bars with different lowercase letters indicate a significant difference (P ≤ 0.05) by Duncan’s multiple range test).

Figure 3 Comparison of bark consumption for four treatments after the first three years of tapping. (T1 = S/2 d2 7d/7; T2 = 2 × S/2 d4 7d/7 (t, t); T3 = S/3 d1 3d/4 7d/7 and T4 = 2 × S/3 d2,d3 7d/7 (t, t). Bars with different lowercase letters indicate a significant difference (P ≤ 0.05) by Duncan’s multiple range test).
current results represent only the preliminary study of an on-station trial in Songkhla province.

**CONCLUSIONS**

In the context of high intensity tapping as used by smallholders in Thailand, where there is currently no problem with the availability of manpower, it is difficult to recommend reduced tapping frequencies, as this would result in days without work for tappers. The current results confirmed the efficiency of the DCA system in increasing labor productivity and yield. The DCA system was also shown to be efficient without the need for stimulation, thus avoiding additional cost for farmers. Moreover, Thai smallholders will be able to use the DCA tapping system with no change in their tapping frequency compared to the conventional tapping system. It should be possible to use the DCA tapping system in Songkhla province, particularly with the RRIM 600 clone. It is too early to recommend the adaptation of a DCA tapping system in southern Thailand but on-farm trials are already underway with a network of candidate farmers in Songkhla province and other provinces to validate the results of on-station trials.

**ACKNOWLEDGEMENT**

This work was supported by higher education research promotion under the National Research University Project of Thailand, Office of the Higher Education Commission. This research was conducted under the Hevea Research Platform in Partnership (HRPP), Thailand. Moreover, the authors would like to express their sincere gratitude to CIRAD (Centre de coopération internationale en recherche agronomique pour le développement).

**LITERATURE CITED**


