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Incidence of Tapping Panel Dryness in the Small Holder Rubber Lands in Kalutara District

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ABSTRACT

Tapping panel dryness (TPD) is widespread in all rubber growing areas and this syndrome is becoming a matter of serious concern. This syndrome of rubber is characterized by the reduction or ultimately total cessation of latex flow upon tapping. Reason for this disorder is yet unclear. This study attempts to find the significance of TPD in rubber small holders in Matugama Divisional Secretarial area of Kalutara District. Mature rubber smallholdings that had been planted during 1998 to 2000, 2001 to 2003, 2004 to 2006 and 2007 to 2009 years were selected for this study. Ten smallholdings were selected from each age category and one tapping block was randomly selected to collect data. Incidence of TPD was found to be relatively high in smallholdings that were tapped for a higher period of times. Out of the total number of TPD trees at a given time more than 50% has occurred during the last 20% of the total tapping period. Also a positive correlation was evident between incidence of TPD and tree girth. The significances of these findings are discussed.

KEYWORDS: Bark consumption, Fully tapping panel dryness, Girth, Partially tapping panel dryness, Rubber small holders

INTRODUCTION

Rubber (*Hevea brassiliensis*) tree is a perennial tropical tree domesticated for the production of natural rubber (NR). In the world, at least 2,000 plant species are recognized for producing latex, but the rubber tree is the only economically viable source of NR. Rubber molecules are produced, aggregated and packed in the latex vessels (laticifers) of the rubber tree. The latex, a cytoplasmic component of the laticifers, expels from the laticifers upon tapping. Over the past decades, the rubber yield has been significantly increased, due to the cultivation of high-yielding clones and the improvements in agro-management (Li *et al.*, 2010).

During harvesting, the recommended standards with regard to slope and depth of tapping cut and thickness of bark shavings have to be achieved. Nevertheless, due to shortage of skilled latex harvesters such standards are not achieved in the field (Nugawela, 2009).

Rubber plays an important role in Sri Lankan economy as one of the main export agricultural crops in the country (Dunsford and Nugawela, 2014). The traditional rubber growing areas of Sri Lanka are located mainly in the wet zone of the country and the main rubber growing districts include Colombo, Gampaha, Kalutara, Kandy, Matale, Galle, Matara, Kurunegala, Rathnapura and Kegalle. Today, the rubber plantations have expanded to nearly 133,668 hectares out of which 85,442 hectares (64%) are cultivated by rubber small holder sector. A further, 46,635 hectares (35%) are owned by 20 regional plantation companies and a further 1,591 hectares (1%) are managed by government Institutions (Anon, 2015).

Smallholder rubber producers in Sri Lanka sell their produce as Ribbed Smoked Sheets (RSS) and/or as latex (Edirisinghe *et al.*, 2013). The level of productivity varies considerably from plantation to plantation due to various factors such as differences in genotypes, agronomic practices, climate *etc.* Some yield determinants are not clearly understood and one major cause resulting in lowering of latex production is the tapping panel dryness (Senevirathne *et al.*, 2007).

Generally high yielding clones of natural rubber are often considered susceptible to tapping panel dryness (TPD), earlier referred to as 'brown bast'. It usually occurs when the harvesting of latex from the tree exceeds the physiological capacity of its regeneration. It is estimated that TPD leads to approximately 15-20% decrease in yield worldwide (Anon, 2002). The exact cause for this disorder is yet to be found. The first symptom of TPD is the appearance of partial dry zones (no latex flow) along the tapping panel. In the advanced stage, the tapping panel may even become completely dry and other symptoms such as browning, thickening, or even flaking of bark can occur (Li *et al.*, 2010). At present, there are no effective measures to prevent or treat TPD in rubber tree.

Generally the rubber smallholders do not adopt the tapping frequency recommended for the clone. Under wet weather they do not tap, but would engage in continuous tapping during dry weather. Very often the use of fertilizer is also less than recommended. The objective of this study is to determine the incidence of tapping panel dryness under such management conditions.

MATERIALS AND METHODS

Location

The study was conducted in the Matugama area of the Kalutara district which belongs to low country wet zone of the country. The area receives an average annual rainfall about 2,998 mm with average annual temperature of 26.9 °C.

Study Area

Kalutara is a major rubber growing area with 33,598 rubber smallholdings with an extent of 19,058 ha (Rubber Research Institute, 2010). There are 57 Grama Niladari (GN) divisions in the Matugama Divisional Secretariat (DS) area and some of the rubber smallholdings found in this area were selected for the study.

Selection of Smallholdings

Mature rubber smallholdings that had been planted during the period 1998 to 2000, 2001 to 2003, 2004 to 2006 and 2007 to 2009 years were identified for the study. The average age of the trees in these smallholdings was around 8, 11, 14 and 17 years respectively and named them as Group 01, Group 02, Group 03 and Group 04. Ten smallholdings were selected from each age category by using simple random sampling method to collect data.

Data Collection

One tapping block, i.e. an area tapped by a harvester on a single day, was randomly selected to collect the data by visiting the selected smallholdings. Healthy, totally dry and partially dry trees were counted in the selected tapping block.

The trees, in which 100 percent of the length of the tapping cut was not yielding, were considered as fully dried trees. Other trees which were not giving latex from the entire length of the tapping cut were considered as partially dried trees.

Tree girth and bark consumption were measured in all dry trees and in ten randomly selected healthy trees in each smallholding selected for the study. Girth was measured at a height of 150 cm from the bud union of the tree. The distance from the initial height of opening to the current panel position or the fully dried cut was measured to determine the bark consumption of healthy and total dry trees respectively.

Data on average bark consumption of healthy trees and number of years of tapping were used to estimate the average bark consumption per year. The bark consumed in total dry trees was divided by the average bark consumption per year to estimate the number of months of tapping for the onset of TPD.

RESULTS AND DISCUSSION

Relationship between Age Category and Tapping Panel Dryness

The percentage of fully dried trees increased with the increasing of age of the tree. The percentage of fully dried trees were 1.6, 2.1, 4.7 and 5.2 respectively for eight, eleven, fourteen and seventeen year old trees (Figure 1). The percentage of partially dried trees also increased with the increasing of age. It was 2.9, 4.7, 5.1 and 6.2 percent for the eight, eleven, fourteen and seventeen year old trees (Figure 1). The total number of TPD trees, i.e. both partially and fully dried also showed the same trend. It was 5, 7, 10 and 11% for eight, eleven, fourteen and seventeen year old trees respectively (Figure 1).

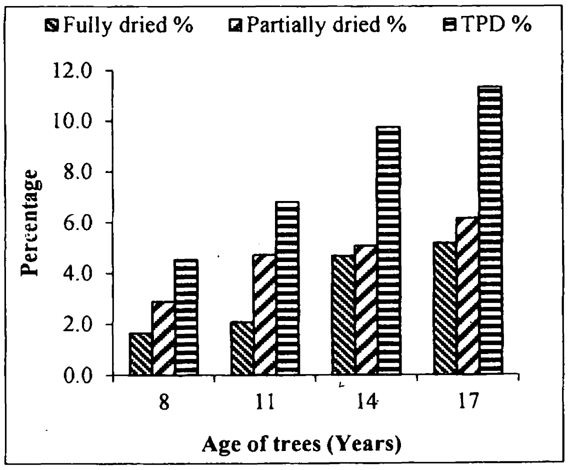

Figure 1. Effect of tree age on the percentages of fully tapping panel dryness, partially tapping panel dryness and the total of fully and partially dried trees

Effect of Tree Girth on Tapping Panel Dryness

Collected data revealed that the total dry tree percentage increased with the increasing of the girth of the tree in all age categories except in category three (Figures 2, 3, 4 and 5). The partially dried trees also showed a similar trend (Figures 2, 3, 4 and 5).

The previous studies had revealed that, the incidence of TPD was highest in extreme girth classes, i.e. highest and lowest (Perera and Nugawela, 2011).

In group 1, the healthy trees were having lowest value for average girth than fully and partially dried trees. It was 55.3 cm. Fully dried trees had 56.8 cm and partially dried trees had 56.4 cm. Similarity in group two lowest girth value was received for healthy trees. It was 58.1

cm. Girths of fully dried and partially dried trees had 62.2 and 60.6 cm respectively. However, in group 3, there was a difference than other group, healthy trees appeared with the highest girth value than fully and partially trees. It was 68 cm and fully and partially dried trees were having 63.9 and 66.2 cm respectively for girths. In group 4, there also healthy trees were having lowest value for girth as 67.3 cm. Fully and partially dried trees were having 73.5 cm, 71.1 cm respectively. Previous studies had proved the same relationship between girth and TPD (Dunsford and Nugawela, 2014; Perera and Nugawela, 2011).

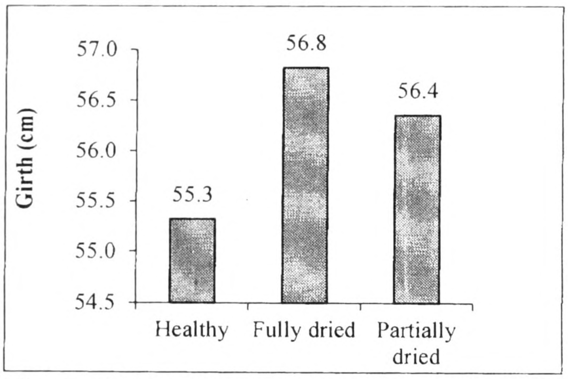

Figure 2. The mean girth of healthy, fully and partially dried trees in around eight year old trees

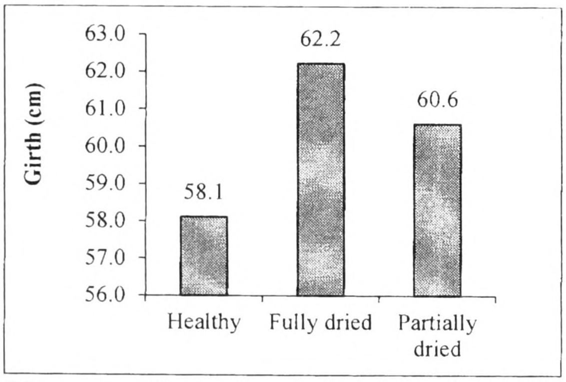

Figure 3. The mean girth of healthy, fully and partially dried trees in around 11 year old trees

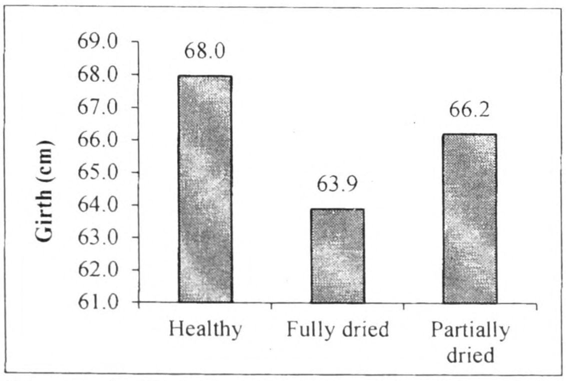

Figure 4. The mean girth of healthy, fully and partially dried trees in around 14 year old trees

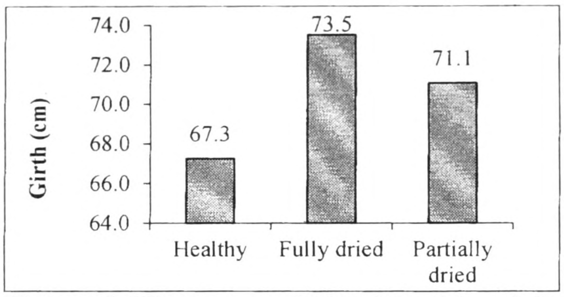

Figure 5. The mean girth of healthy, fully and partially dried trees in around 17 year old trees

Effect of Tapping Period on the Onset of Tapping Panel Dryness

In 17 year old trees out of the total dry trees around 50% had become dry during the latter stage of tapping, i.e. between the 120^{th} and 150^{th} month of tapping (Figure 6). Similarly, out of the total dry trees around 50% has gone dry during the 91^{st} to the 111^{th} month of tapping in trees with an age of around 14 years (Figure 7). Hence it appears that around 50% of the dry trees at a given time has become dry during the last 20% of the total tapping period. Thus it is apparent that the incidence of TPD increases with the tapping age. Tapping Pannel Dryness is believed to be caused by tapping stress (Lacrotte *et al.*, 1997). With the increasing tapping age the stress on the tree can also be increase resulting in trees becoming dry.

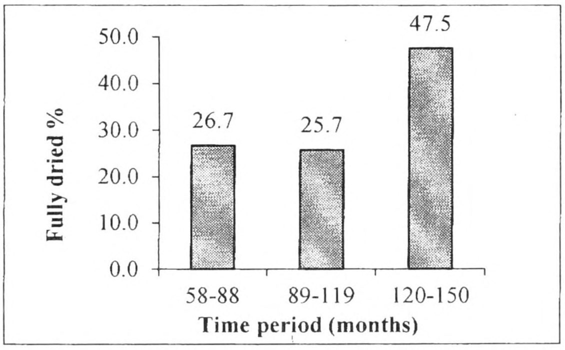

Figure 6. Relationship between time period and fully dried trees percentages in around 17 year old trees

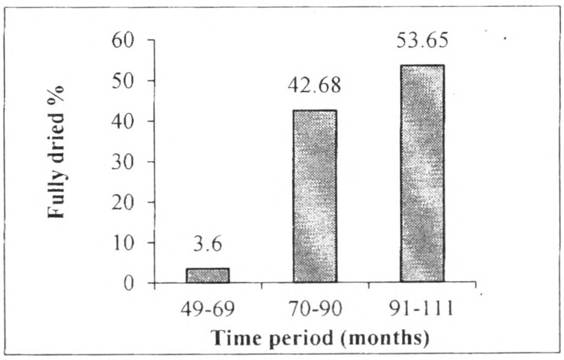

Figure 7. Relationship between time period and fully dried trees percentages in around 14 years old trees

CONCLUSIONS

The study revealed that the incidence of TPD is increasing with the age of the rubber tree. Further analysis also revealed that around 50% of the dry trees present at a given time have become dry during the last 20% of the total tapping period. Tapping Pannel Dryness incidence appear to be higher on trees with relatively higher girth in a population of rubber trees.

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