Impact of climate change on latex harvesting

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Extended abstract

Latex harvesting is a very important part of rubber (*Hevea brasiliensis*) plantation operations as it directly determines the yield of latex obtained from the tapped trees. The latex harvesting operations are affected by climatic factors or issues in a number of ways. Climate change causes tapping operations to be interrupted and needs to be effectively taken into account to ensure latex yield is not reduced.

The main issues related to climate change that have an impact on latex harvesting are the intensity, amount, time and duration of rainfall. Abnormal and unpredicted rainfall especially during early morning hours delays the commencement of tapping. This will lead to delay in completion of tapping into midday and this will cause shorter latex dripping time. Rain during or after tapping operation is completed will lead to partial or total loss of latex. Rains also interrupt the time and frequency of stimulant applications. All these interruptions together with frequent rains during the peak yield months will significantly reduce the obtained yield. Partial or total crop loss can happen when unexpected rain falls while tapping is still in progress or latex is still dripping into the cups. Total number of normal tapping days is reduced due to frequent rain interruptions.

In early 2018, Indonesia and Malaysia experienced severe secondary leaf fall due to fungus attack on young rubber leaves initially infected by *Oidium and/or Colletotrichum*. Under heavy and frequent rainfall, the diseased matured leaves are attacked by *Pestalotiopsis* fungus causing secondary leaf fall, significant reduction in canopy density and drop in rubber yield. Subsequently in 2019 and 2020, India, Thailand and Sri Lanka also suffered a similar bad experience. To date, the total area affected by the secondary leaf fall in the five NR-producing countries is around 400,000 ha.

The secondary leaf fall caused canopy reductions of 50%–90% and yield drops of 15–50%. Figure 1 illustrates the significant yield reduction caused by secondary leaf fall due to *Pestalotiopsis* attack at a plantation in Pulau Belitung, Indonesia from January to May 2020 compared to the corresponding months in 2017 prior to the secondary leaf fall incidence.

On the other hand, climate change results in lengthened dry seasons combined with higher temperatures, and therefore an increased contrast between seasons (rainy/ dry). This is likely to result in a decrease in growth during immature period, and therefore in a delayed opening time, reducing the economic efficiency and delaying return on investment of plantations.

The latex is a cytoplasm composed of about 60% of water. Any factor limiting the water uptake (decrease in rainfall, drought, increased temperature resulting in a break of leaf transpiration...) by the tree will have also a direct depressive effect on the latex yield. Any water deficit will immediately result in a drop in latex regeneration capability (combined with increasing temperature and VPD, leaves stomata closure will result in a blockage of all water transport). Lengthened



Figure 1. Yield of rubber after *Pestalotiopsis* attack in 2020 compared with normal yield in 2017

dry seasons will have also a strong and negative interaction with efficiency of stimulation in case of reduced tapping frequencies, by reducing the possible time window where stimulations can be used. There is therefore an urgent need for adaptation of good agricultural practices under these new conditions. The annual tapping stop during wintering and dry months should be lengthened when the dry season length and severity are increased. In case of reduced tapping frequencies, intervals between stimulations should be decreased, in order to stimulate only during wet months. The annual number of stimulations applied should be reduced as well in order to compensate an increased climatic stress.

Regarding the effect of global warming, it is worth recalling that the latex flow after tapping (duration of flow especially) is linked to the internal turgor pressure of the latex vessels. This is the reason why all rubber planters tap at night or in the early morning, as temperature is then the lowest and latex turgor pressure is the highest (negative relation T°C /turgor). What will happen if the temperature raises by 2°C–3°C at the time of tapping is totally unknown, as rubber tree has never been planted and therefore tapped in areas where mean annual temperatures are above 28°C. Before thinking of possible adaptation measures, there is an urgent need of research on the effects of higher temperatures on the biology of the tree and on the physiology of the latex system in order to assess their possible impacts on yield and to set up GAPs under these new conditions.

Key words: Latex harvesting, climate change, secondary leaf fall, *Pestalotiopsis*, rain interruptions, temperature, natural rubber, growth, production, physiology

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