TEA FACTORY FIREWOOD ASH AS A POTENTIAL PLANT NUTRIENT SOURCE FOR MATURE TEA

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The major sources of energy for heat generation to wither green leaves and to dry fermented dhool in tea factories are rubber and jungle mixed firewood. A considerable amount of firewood is used during manufacture of black tea and large quantity of firewood ash is accumulated in tea factories causing environmental issues. Wood ash retains the overall composition of the mineral nutrients in the fire wood with the exception of nitrogen compounds, which are mainly released through gases as a result of oxidation processes during combustion of fire wood. Therefore fire wood ash could be recognized as a potential source of plant nutrient.

The presence of potassium, calcium, and magnesium carbonate or oxides, which are strongly alkaline, is comparatively high in wood ash could therefore neutralize acid soils. This alkaline reaction is the main limitation in using wood ash as a plant nutrient source in tea cultivation. However information on composition and plant nutrient values of wood ash and its application in tea plantations is scanty.

Thus an in-depth study was under taken to investigate the suitability of tea factory wood ash as a plant nutrient source for mature tea. The experimental sites were selected based on their pH buffering capacities. The experiments were conducted at St Coombs estate, Moragalla Estate and Kurugama Estate to represent high low and medium pH buffering capacities respectively. The different rates of wood ash (1000, 2000 kg ha^{-1} $year^{-1}$) and refuse tea or compost (20 tons ha^{-1} $year^{-1}$) with or without urea (270N kg ha^{-1} $year^{-1}$) were compared with TRI recommended fertilizer mixture VP/UM 910 or VP/UM 880.

Results revealed that at St Coombs Estate where soil buffering capacity is high, soil pH values were at optimum level throughout the study period whereas in the low country with low pH buffering capacity pH values could not be maintained at optimum level throughout study period. However no detrimental effects were observed after application of wood ash in both locations. Soil available phosphorous, potassium, magnesium and calcium in wood ash applied soils were comparable with that of in inorganic mixture applied soils. Also, the leaf N, P, K, Mg and Ca concentration and yield improvement in wood ash applied plots were comparable with that of TRI recommended fertlizer mixture in both locations.

It can therefore be concluded that application of wood ash with refuse tea/compost and urea can be considered as a potential nutrient source and alternative for present TRI inorganic fertilizer recommendation for mature tea. In order to recommend wood ash to the stakeholders, adaptive trials have to be carried out to validate the results under grower practices prior to release the recommendation.

Keywords: Tea factory wood ash, Plant nutrients, Refuse tea, Compost, Soil pH buffering capacity

PHYSIOLOGICAL EFFECTS OF MECHANIZED HARVESTING OF TEA AND WAYS TO MINIMIZE ITS IMPACTS

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Worker scarcity and high cost of labour have become serious constraints in Sri Lankan tea industry. Absenteeism of workers prolongs the plucking rounds resulting in loss of yield and quality of product. Although mechanical tea harvesting is an alternative, it has reported to cause yield reductions in Sri Lanka. In order to identify the physiological basis of yield decline under mechanical harvesting, investigation was conducted using three mechanical devices, viz., selective shear (selective harvesting), non-selective shear and motorized harvester (non-selective harvesting) and compared with manual harvesting.

Results showed significant yield losses under non-selective mechanical harvesting methods compared to manual and selective harvesting. The yield losses were attributed to (a) removal of immature (arimbu) shoots, (b) removal of maintenance foliage and (c) higher severity of harvesting of shoots. Manual harvesting added a significantly higher leaf area to the canopy than mechanical harvesting. The leaf thickness was found to be lower in mechanically harvested bushes than those of manually harvested. Additionally, mechanical harvesters removed the top leaf layers and exposed the lower layers to direct sunlight which may have induced photo-inhibitory effects affecting assimilation. Consequently, dry matter accumulation within the plucking table was higher in selectively harvested bushes compared to those of harvested by non-selective methods. Further, mechanically harvested tea bushes recorded low root starch reserves and poor frame development which influence translocation of water, nutrient and assimilates.

The major impacts of mechanical harvesting viz., removal of arimbu shoots, removal of maintenance foliage and higher severity of harvesting have contributed 55%, 12% and 15% of yield reductions compared to manual harvesting. Therefore use of harvesting machines should be limited to high cropping seasons (rush crop) and under extreme worker shortage scenario.

In order to minimize adverse effects of mechanical harvesting, it is important to avoid cutting deep into the plucking table, ensure proper management of shade and fertilizer, adopt other good agricultural practices and irrigation during unfavorable weather etc.

Keywords: Mechanical harvesting, physiology, tea, yield decline

DEVELOPMENT OF AN INDEX TO ASSESS IMPACTS OF GRASS REHABILITATION IN OLD TEA FIELDS

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The lands under tea for few decades are subjected to soil degradation and denude its productivity status due to frequent removal of nutrients and dry matter, extreme rainfall patterns and dry spells etc. Further, soil quality diminishes depending on elevation, region, terrain, level of agronomic practices and land use pattern. In order to ensure to maintain and sustain productivity of tea, soils are expected to facilitate root development, water storage and nutrient supply. Therefore soil fertility management is of paramount importance in tea cultivation.

Amongst various GAPs recommended for tea cultivation, soil rehabilitation using grasses such as Mana or Guatemala for a period of 18-24 months is a process prior to tea planting in old tea fields. Importance of soil rehabilitation further qualify due to proliferation of perennial soil borne pests and diseases and the threat looming by climate change etc., However, the process is laborious and costly and pose economic losses owing to time taken since uprooting old tea, for rehabilitation and delayed crop return. In view of this attempts were made to develop a Soil Quality Index (SQI) to assess the quality status of the soil in old tea lands prior to make decisions on rehabilitation.

Data on bulk density (BD), available water content (AWC), organic carbon content (C) and microbial biomass content (MBC) in soils were estimated in grass planted (approximately for two years) and adjacent old tea fields in 37 tea estates representing elevations and agro ecological regions. Data were transformed to core values ranging from 0-10 for each parameter and SQI was calculated as the summation of weighted scores assigned to individual parameter.

According to SQI calculations, the calculated base reference levels of SQI were 5.0 for Low country, 6.0 for Mid country, 7.0 for Up country and Uva. Results also elucidated that two year grass rehabilitation has given rise to increase in SQI by 26% in Low and Mid country, by 11% in Up country and by 19% in Uva. Pre requisites of the application of SQI in decision making are (i) infestation levels of parasitic nematodes, up country live wood termites and poria in respective regions.

Keywords: grass rehabilitation, Soil Quality Index (SQI), old tea fields