EFFECT OF ORGANIC MATTER ADDITION AND SOIL COMPACTION ON GROWTH OF RUBBER SEEDLINGS RAISED USING YOUNG BUDDING TECHNIQUE

E.A.D.SIRIWARDANE [1], R.S.DHARMAKEERTHI [2*] AND R.B.MAPA [1]

[1] *Department of Soil Science, Faculty of Agriculture, University of Peradeniya*
[2] *Department of Soil and Plant Nutrition, Rubber Research Institute, Agalawaththa*

Introduction

The latex yield of Sri Lankan Rubber plantations are low as 1140 Kg/ha/yr compared to the potential of 2000-3000 Kg/ha/yr. One proposed way to increase the productivity of rubber lands of Sri Lanka is by use of quality planting material raised by young budding technique. However, it has been observed that about 5-10 % young budded plants die-off when scion is about 4-6 weeks old, particularly during dry and hot weather, possibly due to poor root generation. This study aims to promote the root growth of rubber seedlings by improving the soil physical properties through organic matter addition to surface soil and reducing the compact in poly bags.

Methodology

The experiment was conducted at Rubber Research Institute, Agalawatta during period between October 2007 and March 2008. Fertile top soils from Agalawatta series (Red Yellow Podsolic) was used with either coir dust or saw dust in this experiment. Five types of potting media (soil only, soil and coir dust 1:1, soil and coir dust 3:1, soil and saw dust 1:1, soil and saw dust 3:1) were filled to poly bags with two compaction levels (loose and compact) giving 10 treatment combinations with 20 replicates and arranged according to the Randomized Complete Block Design (RCBD). Seedlings from RRI 121 clone were used for the experiment Potting media were characterized for their physical (bulk density, particle density, porosity and water holding capacity) and chemical properties (pH, organic C , Total N% and C:N ratio).

Height, diameter and dry weights of shoots, lengths and dry weights of roots (tap, lateral, feeder) were measured at the end of 3 months after planting. Data were analyzed by using Statistical Analysis System (SAS, 1996).

Results and discussion

Bulk densities at the beginning and after three months from planting, organic C% and total N % are shown in Table 1. Bulk density is commonly used as a measure of soil compaction. Bulk density increased at three months after planting than the initial bulk density of potting media in poly bags. Greacen and Sands (1980) reported that management practices and growth of roots compact the soil. When organic matter (saw dust or coir dust) was added to the soil, organic C % and total N % increased. The results showed that there was a significant effect of organic matter addition and soil compaction on rubber seedlings raised by young budding technique.

Shoot dry matter, feeder root length and feeder root dry weights were significantly affected by compaction and type of potting media. However lateral root length and height of the plant was not affected by compaction. Root lengths and weights in loosely packed potting medium was significantly higher than that in compacted medium (Table 2). Greacen and Sands (1980) showed that, when soil was compacted, water and nutrients within the volume occupied by the restricted root system become limiting while the shoot growth was inhibited. Root growth was significantly higher in seedling growth in organic matter treated potting media compared to soil only potting media. Root growth in coir dust mixed media was higher than saw dust treated and soil only media (Table 2). Samarappuli et al., 1996 showed, When coir dust was added as

a mulch, root spread and root length is significantly higher than soil only (without mulch) treatment. Shoot and root growth of rubber seedlings in soil: coir dust 3:1-loose treatment was significantly higher than the other treatments.

Conclusion

Out of the methods tested, Coir dust mixed with top soil at a ratio of 3:1 and loosed packed medium was the best media for growth of rubber seedlings grown in poly bags.

Table 2. Effect of organic matter and soil compaction shoot and root growth

Abbreviations	Treatment	Bulk Density (g/cm^3)		Organic C %	Total N%
		At beginning	After 3 months		
S-L	Soil only- Loose	1.05	1.24	1.7	0.101
S-C	Soil only – compact	1.20	1.30	1.7	0.101
SC 1:1-L Soil:	Coir dust 1:1 –Loose	0.68	0.82	3.2	0.112
SC 1:1-C Soil:	Coir dust 1:1 –Compact	0.84	0.92	3.2	0.112
SC 3:1-L Soil:	Coir dust 3:1 –Loose	0.96	1.04	2.2	0.107
SC 3:1-C Soil:	Coir dust 3:1 –Compact	1.06	1.12	2.2	0.107
SS 1:1-L	Soil: Sawdust 1:1 –Loose	0.74	0.76	8.5	0.111
SS 1:1-C	Soil: Sawdust 1:1 –Compact	0.79	0.81	8.5	0.111
SS 3:1-L	Soil: Sawdust 3:1 –Loose	0.88	0.96	3.2	0.102
SS 3:1-C Soil:	Sawdust 3:1 –Compact	0.96	0.98	3.2	0.102

Table 2. Effect of organic matter and soil compaction shoot and root growth

Treatment	Height (m)	Diameter (mm)	Shoot Dry Weight (g)	Lateral Root Length (m)	Feeder Root Length (m)	Feeder Root Weight (g)
S-L	0.49	5.31	7.38	0.80	4.47	0.51
S-C	0.50	5.04	7.30	1.08	3.23	0.51
SC 1:1-L	0.52	5.22	9.26	1.32	12.17	0.89
SC 1:1-C	0.51	5.49	9.51	0.64	10.65	0.74
SC 3:1-L	0.53	5.57	9.83	0.67	25.04	1.22
SC 3:1-C	0.51	5.44	9.70	0.88	16.28	0.94
SS 1:1-L	0.49	5.25	8.77	0.32	20.34	1.09
SS 1:1-C	0.52	5.06	8.15	0.53	13.33	0.80
SS 3:1-L	0.54	5.37	9.01	0.57	18.77	1.00
SS 3:1-C	0.49	5.24	8.68	0.40	16.43	0.78

References

Greacen EL and Sands R (1980). Compaction of forest soils, Australian Society of soil Research.

Samarappuli L, Yogatrathnam N, Karunadasa P (1996). Root development of *Hevea brasiliensis* in relation to management practices, Journal of Rubber Research Institute of Sri Lanka.