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EFFECT OF DIFFERENT TREE CANOPY SOILS ON GROWTH AND QUALITY OF ORANGE SEEDLINGS ROOTSTOCK

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Abstract

The present study was conducted in the college of Agriculture, Nagpur (Maharashtra), India. All tree canopy soil samples were collected from Futala farm in September, 2014. The experiment was laid out in complete randomized block design (CRBD) with three replications and twelve treatment combinations compromising different tree canopy soil and jamberi and rangpur lime root stocks. The germination of orange seedling (Jambheri and Rangpur lime) found maximum in tree canopy soil than in field soil. The growth parameters like plant height (3.90 cm), number of leaves per rootstock (2.00) and leaf area (12.90 cm^2) was found maximum in canopy soil of orange tree than other tree canopy soils. The growth of rangpur lime rootstock was better than jambheri rootstock. The chlorophyll content (1.25%) was also maximum in orange tree canopy soil with rangpur lime rootstock (T_{11}) than in other treatments. The growth of rangpur lime rootstock grown in canopy soil of orange tree was better than grown in other canopy soil because the proper atmosphere need for microorganisms present in orange tree canopy soil was not change and they got comfort zone for their metabolic activities.

Key words : Tree canopy, growth, quality, rootstock, chlorophyll content.

Introduction

There is a higher nutrient availability in the rhizosphere *i.e.* tree canopy soil than in non rhizosphere soil. Rhizosphere, the region of soil in the vicinity of the root and under its constant influence is a dynamic soil environment. Soils differ widely in the ability to meet plant requirements. Most soils have moderate natural soil fertility but can be considerably improved by soil amelioration. For successful farming, the natural fertility of the soil is often less important than its potential productivity after the removal of its inherent limiting factors. Soils with high natural fertility can produce substantial crop yields without added fertilizers and can achieve even higher yields with additional supply of critical nutrients. Good soil fertility provides the basis for all other measures for successful farming.

Hiltner (1904), who first used the term rhizosphere to describe the stimulation of microbial biomass and activity in the soil surrounding plant roots, where the biology and chemistry of the soil are influenced by the root.

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Rhizosphere is one of the 'hot spot' where soil biota aggregate and resources are more abundant with a faster mass and energy transformation. The rhizosphere soil would lead to increased N and P mineralization by improving microbial activity, but the magnitude of these effects would vary with species due to differences in intrinsic biological characteristics.

Materials and Methods

An experiment on "Effect of different tree canopy soil on growth of orange rootstock" was conducted at College of Agriculture, Nagpur (Maharashtra), India; during September 2014 to April 2015. Seeds of Jambheri and Rangpur lime rootstock were used. Soils under different tree canopy like banyan, peepal, mango, lemon, orange and field soil samples were used for growing the orange rootstock to study the effect of these soils on growth of orange rootstock. All tree canopy soil samples *i.e.* the rhizosphere soil samples were collected from Futala farm in September, 2014.

The field experiment was laid out in Completely Randomized Block Design (CRBD) with three replications consisting of twelve treatments comprising different tree canopy soil.

Table 1: Morpho-physiological observation after 45 days of germination of seedling

Treatments	Germination percentage (%)	Height of seedling (cm)	No. of leaves	Thickness of stem (mm)	Leaf area (cm^2)	Chlorophyll ($mg\ g^{-1}$)
BRSJR (T_1)	80.00	3.80	1.33	0.09	12.43	1.22
PRSJR (T_2)	66.67	2.24	1.33	0.09	11.40	1.21
MRSJR (T_3)	80.00	3.29	1.73	0.12	11.90	1.17
LRSJR (T_4)	73.33	2.53	1.46	0.11	11.60	1.23
ORSJR (T_5)	80.00	3.69	1.73	0.12	12.53	1.28
FSJR (T_6)	66.67	2.00	1.03	0.07	10.70	1.08
BRSRLR (T_7)	80.00	3.67	1.13	0.12	12.43	1.19
PRSRLR (T_8)	80.00	3.40	1.46	0.11	12.57	1.20
MRSRLR (T_9)	73.33	3.26	1.20	0.09	11.33	1.18
LRSRLR (T_{10})	66.67	2.80	1.60	0.12	11.77	1.22
ORSRLR (T_{11})	80.00	3.90	2.00	0.10	12.90	1.25
FSRLR (T_{12})	66.67	2.50	1.00	0.08	9.83	1.10
Mean	74.44	3.11	1.39	0.10	11.74	1.19
F test	Sig.	Sig.	Sig.	NS	Sig.	Sig.
S.E(m)±	3.84	0.22	0.12	0.01	0.47	0.02
CD @ 5%	11.22	0.66	0.37	-	1.37	0.06

Seeds were sown at the rate of 5 seedlings pot^{-1}. After 45 days of seedling germination, germination per cent, height of seedling, number of leaves per rootstock, leaf area and thickness of stem were recorded. Removal of seedlings in all the treatments was undertaken after 45 days and analyzed for chlorophyll content from plant sample, standard chemicals and reagents were used in this experiment. Total chlorophyll content of oven dried leaves was estimated by using 80% acetone as suggested by A.O.A.C. (1976).

Results and Discussion

After 45 days of seedling germination morpho-physiological observations were recorded germination percentage (%)

The data on average germination percentage after 45 days in various treatments is presented in table 1. The data indicated that there was significant variation in respect of seed germination percentage in all the treatments. The maximum germination was observed in banyan tree canopy soil with Jambheri rootstock (T_1), mango tree canopy soil with Jambheri rootstock (T_3), banyan tree canopy soil with Rangpur lime rootstock (T_7), orange tree canopy soil with Jambheri rootstock (T_5), peepal tree canopy soil with rangpur lime rootstock (T_8) and orange tree canopy soil with rangpur lime rootstock (T_{11}). Whereas, lemon tree canopy soil with jamberi rootstock (T_3) and mango tree canopy soil with rangpur lime rootstock (T_9) was at par with above treatments. The minimum germination percentage was observed in field canopy soil with both jamberi and rangpur lime rootstocks.

Height of seedlings after 45 days of germination

The data pertaining to average height of seedlings per treatment is presented in table 1. There was slight variation in seedlings height. The maximum seedling height (3.9 cm) was observed in orange tree canopy soil with rangpur lime rootstock (T_{11}), which was at par with banyan tree canopy soil with jamberi rootstock (T_1) and orange tree canopy soil with jamberi rootstock (T_5). The minimum seedling height (2.00 cm) was observed in field soil with Jambheri rootstock (T_6). The mean germination percentage was 74.44 per cent.

Number of leaves $seddling^{-1}$

The maximum number of leaves (2.0) was recorded in orange tree canopy soil with rangpur lime rootstock (T_{11}), which was at par with mango tree canopy soil with jamberi rootstock (T_3) and orange tree canopy soil with jamberi rootstock (T_5). The minimum number of leaves (1.00) was observed in field soil with Rangpur lime rootstock (T_{12}) followed by field soil with jamberi rootstock (1.03).

Thickness of stem (mm)

The data regarding the average thickness of stem as influence by different treatment is presented in table 1. There was no significant difference in the thickness of stem in all the treatments. The maximum thickness of stem observed in treatment orange tree canopy soil with jamberi root stock (0.12 mm) and lemon tree canopy soil with rangpur lime rootstock (0.12 mm), followed by lemon tree canopy soil with jamberi root stock (0.11 mm) and papal tree canopy soil with rangpur lime root stock (0.11 mm). The minimum thickness of stem was observed in field soil with jamberi rootstock (.07 mm).

Leaf area (cm^2)

The data regarding the average leaf area influenced by different treatments are presented in table 1. The maximum leaf area (12.90 cm^2) was recorded in orange tree canopye soil with rangpur lime rootstock ($\mathbf{T_{12}}$), which was at par with banyan tree canopy soil with jamberi rootstock (12.43 cm^2), mango tree canopy soil with jamberi root stock (11.90 cm^2), orange tree canopy soil with jamberi rootstock (12.53 cm^2) and papal tree canopy soil with rangpur lime rootstock (12.57 cm^2). The minimum leaf area (9.83 cm^2) was recorded in field soil with jambheri rootstock ($\mathbf{T_{12}}$). The leaf area data was statastically significantly.

Total chlorophyll content in seedlings (mg g^{-1})

The data on total chlorophyll content in seedlings is recorded in table 1. The maximum chlorophyll content (1.28 mg g^{-1}) was recorded in orange tree canopy soil with Jambheri rootstock ($\mathbf{T_5}$), which at par with banyan tree canopy soil with jamberi rootstock (1.22 mg g^{-1}), lemon tree canopy soil with jamberi rootstock (1.23 mg g^{-1}), lemon tree canopy soil with rangpur lime rootstock (1.22 mg g^{-1}) and the orange tree canopy soil with rangpur lime rootstock (1.25 mg g^{-1}). The minimum chlorophyll content was observed in field soil with jamberi rootstock (1.08mg g^{-1}).

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