

Original Research Article

<https://doi.org/10.20546/ijcmas.2020.911.368>

Influence of Inter Cropping Systems on Physio-Chemical Properties of Soil in Aonla (*Emblica officinalis Gaertn L.*) Plantation

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ABSTRACT

The present investigation entitled “Influence of intercropping systems on physio-chemical properties of soil in Aonla (*Emblica officinalis Gaertn L.*) plantation” was carried out during 2019 at the Department of Horticulture, SHUATS, Prayagraj. The result of the present investigation, regarding the Influence of intercropping systems on physio-chemical properties of soil in Aonla. The experiment was laid out in Randomized Block Design (RBD), replicated thrice with the six intercropping system treatment combination of T₀: Sole crop, T₁: Spinach, T₂: Radish, T₃: Tomato, T₄: Coriander, T₅: Okra and T₆: Fenugreek. From the present investigation the treatment T₂ Radish showed significant improvement in particle density, organic carbon, available nitrogen, available phosphorous, available potassium and minimum bulk density and ph and was recorded. In the treatment T₂ is the best for Intercrop Yield (q/ha) (198.53) under Prayagraj agro-climatic condition.

Keywords

Aonla, Intercrops, Physical and chemical properties, Soil health

Article Info

Accepted:

22 October 2020

Available Online:

10 November 2020

Introduction

Aonla or Indian gooseberry (*Emblica officinalis Gaertn L.*) is an important indigenous fruit crop in India, which belongs to the family Euphorbiaceae and subfamily phyllanthoideae. It is native of Tropical South-East Asia. Its commercial cultivation is common in India, particularly in Uttar Pradesh, Haryana, Punjab and Gujarat etc.

Gujarat occupies 12481 ha area with 121514 million tons [M.T.] productions, Where as in Middle Gujarat cover 7197 ha area with the production of 75559 [M.T.] (Anonymous, 2011).

It is the richest source of vitamin C (400-1300 mg/100 g from pulp) among the fruits next to Barbados cherry (Mandal *et al.*, 2013). Soil type, fertility and nutrient management play

an important role in obtaining higher growth and yields of Aonla. Inadequate nutrition has very often been attributed as the cause of lower yields in Aonla. Therefore, balanced nutrition is important, both for young growing plants as well as grown-up fruit-bearing trees. However, a bearing tree requires a balanced nutrient application for the maintenance of vegetative growth along with fruit production. Indiscriminate use of chemical fertilizers had adversely affected the soil fertility, water quality, yield and quality of the produce and increased level of resistance in pests (Kalloo, 2003).

The intercropping system is an integrated method of crop management system or organic farming system to balance the nutrient, water, land surface use and augmentation of additional farm returns. “The intercropping of short duration seasonal crops under available interspace between Aonla plantation under wasteland conditions have shown significant impacts on soil and crop management. However, no information is available are available in literature as per the suitability of selective intercrops including, oilseed, cereals, such as pulses vegetable species, medicinal and aromatic crops and other short-duration fruit species. The crop management practices based on multitier cropping system has not yet been standardized to different bearing age of trees moisture level and fertility status of soils. The scientific studies son synergetic, bioaesthetic eco – friendly economic feasibility, nutrient availability and increasing activities are very much needed to study about perennial fruit trees (Singh *et al.*, 2016).

Materials and Methods

The experiment was laid out in Randomized Block Design (RBD), replicated thrice with the six intercropping system treatment combination of T₀: Sole crop, T₁: Spinach, T₂:

Radish, T₃: Tomato, T₄: Coriander, T₅: Okra and T₆: Fenugreek. The observation was recorded on physio-chemical properties of soil Aonla plantation *viz.*, Bulk density (g/cc), particle density(g/cc), pH, organic carbon (%), available nitrogen(kg/ha), available phosphorous(kg/ha), available potassium). The data recorded during investigation were subjected to statistical analysis as per the method of analysis of variance.

Results and Discussion

As per the data recorded in table-1 and figure-1 shows the maximum bulk density of soil at crop harvest of intercropping system was found in T₀ Sole crop was 1.42 and minimum values of the bulk density (g/cc) result was found in T₂ Radish was (1.17). Similar findings were reported by (Akanksha *et al.*, 2017) in Custard apple and (Saswati *et al.*, 2017) in Guava.

As per the data recorded in table-1 and figure-1 shows the maximum particle density of soil at crop harvest of intercrops system was found in T₂ Radish was 5.37 and minimum values of the particle density (g/cc) result was found in T₁ sole crop was (4.33). Similar findings were reported by (Peter *et al.*, 2016).

As per the data recorded in table-1 and figure-1 shows the maximum pH of soil at crop harvest of intercrops system was found in T₀ Sole crop was 7.85 and minimum values of the pH result was found in T₂ Radish was (7.20). Similar findings were reported by (Akanksha *et al.*, 2017) in Custard apple and (Gitari *et al.*,) in Potato.

As per the data recorded in table-2 and figure-2 shows the maximum organic carbon (%) of soil at crop harvest of intercrops system was found in T₂ Radish crop was 0.58 and minimum values of the organic carbon (%) result was found in T₀ Sole crop was

(0.34). Similar findings were reported by (Akanksha *et al.*, 2017) in Custard apple.

As per the data recorded in table-2 and figure-2 shows the maximum available nitrogen (kg ha⁻¹) of soil at crop harvest of intercrops system was found in T2 Radish crop was 268.09 and minimum values of the available nitrogen (kg ha⁻¹) result was found in T0 Sole crop was (258.51). Similar findings were reported by (Adivappa *et al.*, 2019) in Custard apple and (Asangi *et al.*, 2019) in Custard

apple. As per the data recorded in table-2 and figure-2 shows the maximum available phosphorus (kg ha⁻¹) of soil at crop harvest of intercrops system was found in T2 Radish crop was 68.52 and minimum values of the available phosphorus (kg ha⁻¹) result was found in T0 Sole crop was (61.45). Similar findings were reported by (Divya *et al.*, 2018) in Soyabean and (Asangi *et al.*, 2019) in Custard apple.

Table.1 Influence of intercrops on physical properties of soil in Aonla plantation

Treatments combination	Bulk density (g/cc)	Particle density(g/cc)	pH
T ₀ Sole crop	1.42	4.33	7.85
T ₁ Aonla+Spinach	1.38	4.25	7.88
T ₂ Aonla+Radish	1.17	5.37	7.20
T ₃ Aonla+Tomato	1.24	4.70	7.45
T ₄ Aonla+Coriander	1.25	4.83	7.43
T ₅ Aonla+Okra	1.21	4.39	7.63
T ₆ Aonla+Fenugreek	1.25	4.60	7.63
F-test	S	S	S
C. D. at 0.5%	0.127	0.348	0.497
S.Ed. (±)	0.058	0.160	0.228

Table.2 Influence of intercrops on chemical properties of soil Aonla plantation

Treatment combinations	Organic carbon (%)	Available nitrogen (kg ha ⁻¹)	Available phosphorous (kg ha ⁻¹)	Available potassium (kg ha ⁻¹)
T ₀ Sole crop	0.34	258.51	61.45	238.47
T ₁ Aonla+Spinach	0.39	261.50	64.41	271.69
T ₂ Aonla+Radish	0.58	268.09	68.52	278.89
T ₃ Aonla+Tomato	0.48	264.17	66.68	277.57
T ₄ Aonla+Coriander	0.39	262.94	66.20	276.43
T ₅ Aonla+Okra	0.35	265.22	63.47	276.87
T ₆ Aonla+Fenugreek	0.41	263.54	66.71	278.78
F-test	S	S	S	S
C. D. at 0.5%	0.073	1.845	1.124	1.669
S.Ed. (±)	0.034	0.847	0.516	0.766

Figure.1 Influence of intercrops on physical properties of soil in Aonla plantation

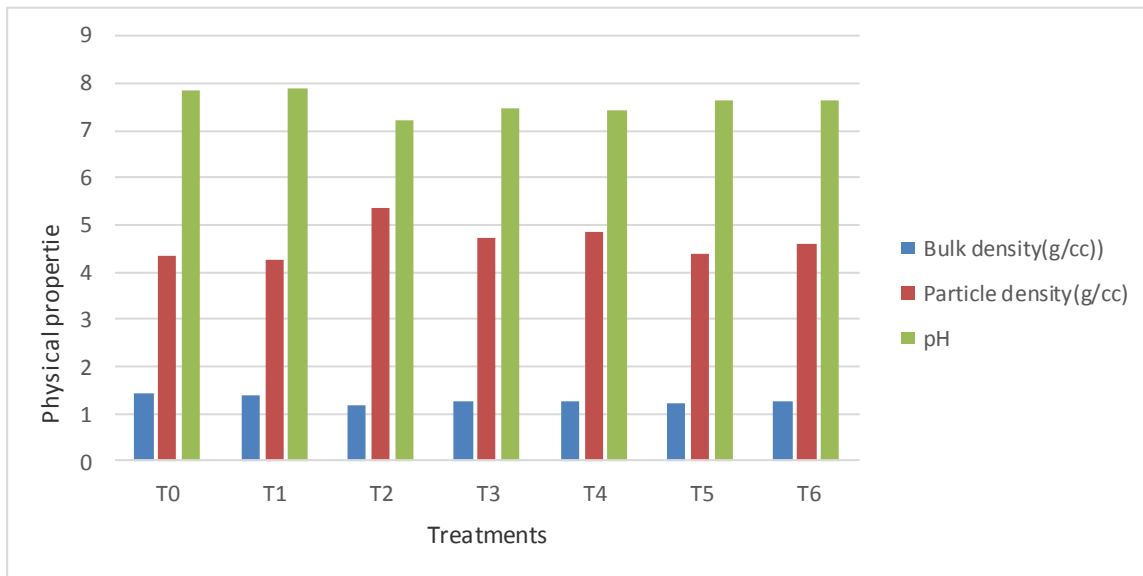
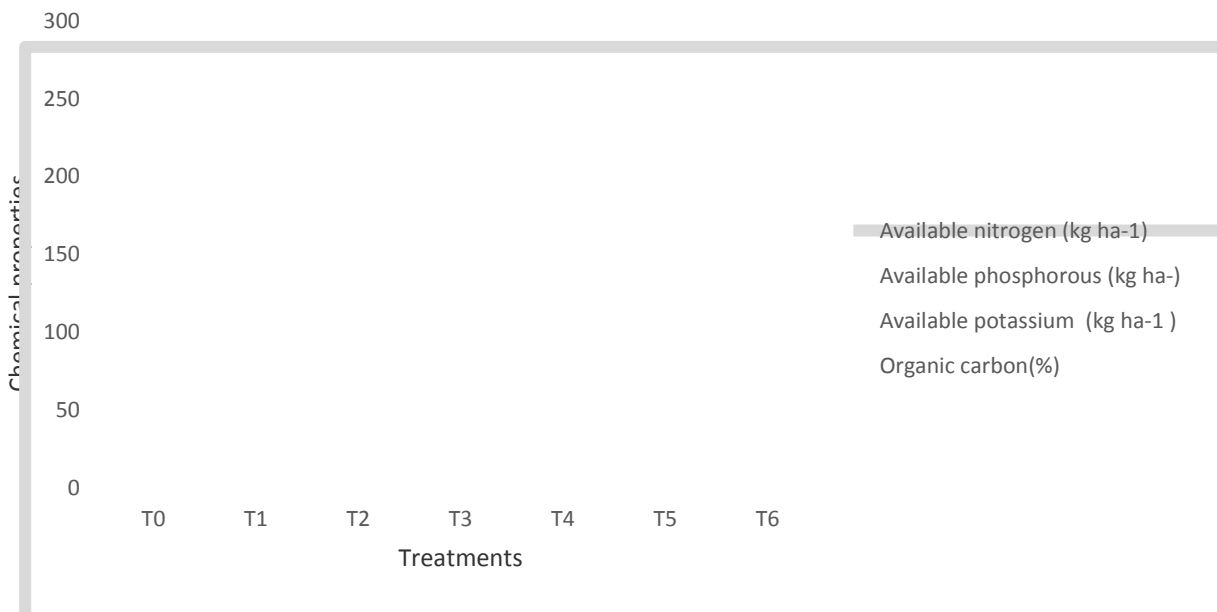


Figure.2 Influence of intercrops on chemical properties of soil in Aonla plantation



As per the data recorded in table-2 and figure-2 shows The maximum available potassium (kg ha⁻¹) of soil at crop harvest of intercrops system was found in T2 Radish crop was 278.89 and minimum values of the available potassium (kg ha⁻¹) result was found in T0 Sole crop was (238.47). Similar findings were

reported by (Saswat *et al.*, 2017) in Guava. From the present investigation it is concluded the treatment T₂ Radish is the best significant improvement in physio-chemical properties of soil in Aonla plantation. It may be concluded that the treatment T₂ and T₅ recorded better growth and yield of Radish and Aonla tree.

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How to cite this article:

Bhavanasi Dharani and Balram Pusam. 2020. Influence of Inter Cropping Systems on Physio-Chemical Properties of Soil in Aonla (*Emblica officinalis Gaertn L.*) Plantation. *Int.J.Curr.Microbiol.App.Sci.* 9(11): 3039-3043. doi: <https://doi.org/10.20546/ijcmas.2020.911.368>