INT. J. BIOL. BIOTECH., 19 (4): 525-531, 2022.

IMPROVEMENT OF CROP PLANTS GROWTH USING *MEDICAGO SATIVA* L. WITH ORGANIC AND INORGANIC FERTILIZERS

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ABSTRACT

Medicago sativa Linn. belongs to legume family (Fabaceae) that has been grown as a fodder for livestock and contains superior contents of vitamins, minerals and protein. Present research work was carried out to observe the antifungal activities of *M. sativa* different parts including leaves, flowers and fruits extracts at the concentration of 100% w/v that showed greater inhibition of root rot pathogens (*F. oxysporum*, *R. solani* and *M. phaesolina*). Growth parameters like shoot/root length, shoot/root weight/number of nodules were also increased by using combined treatments of both systemic/bio fertilizers as compared to control. Both cowpea and okra seeds were treated with leaves extracts at 100% w/v and soil amended with systemic fertilizers such as frutan and urea at 0.1% w/w and bio fertilizer such as *Ascophyllum nodosum* and cow dung at 0.1% w/w suppressed completely root rot fungi as well as improved the plant growth.

Keywords: Plant parts extracts, fertilizers and root pathogenic fungi, okra, cowpea.

INTRODUCTION

Essential elements for systemic fertilizers are nitrogen, phosphorus, sulphur and potassium which are considered as main nutritional compounds required for all phases of plant growth and produce quality based crop yields. The organic manures play an important role to improve fertility of soil, antioxidant and defence mechanism against pathogens and also producing high crop yields (Dumas *et al.,* 2003; Sanwal *et al.*, 2007; Deshmukh *et al.,* 2010). Use of plant powder as fertilizer in agricultural field, improves physical/chemical/biological properties of soil as these plant powder contains antifungal compounds capable of inhibition of plant pathogens (Zin and Badaluddin, 2020; Hassan *et al.,* 2021).

Seaweeds are rich in polyunsaturated fatty acids, steroids, terpenes, carotenoids, sulphated polysaccharides, sesquiterpene hydroquinins, mycosporins, acetogenins, phenols, amino acid derivatives, vitamins (A, B_1, B_{12}, C, D) and biochemicals (Safinaz and Ragaa, 2013). *Ascophyllum nodosum* commonly known as "Norwegian Kelp" contains high amounts of carbohydrates, amino acids, natural hormones, alginates, minerals, trace elements and biostimulant ability (Fernandes and de Oliveira Silva, 2011).They are also very good in minimizing environmental pollution and improving cellular elasticity and high resistance to various abiotic factors (Wang *et al*., 2017). Plant biostimulants are a new class of crop and agro-chemical which reduce synthetic fertilizers and pesticides and increasing nutrient availability (Calvo *et al*., 2014; Van Oosten *et al*., 2017; Ahmadi *et al.*, 2015; Shukla *et al.*, 2016; Okolie *et al*., 2018).

Worldwide, about 85,000 plant species with their parts like leaves, root, seeds, stem, fruit, barks are used for the preparation of medicines (World Health Organization, 2001; Liu and Wang, 2008). *Medicago sativa* Linn. commonly known as the "father of all foods" are a great source of minerals and proteins which also increases soil nitrogen fertility and eliminate soil erosion (Latrach *et al.,* 2014).Human used alfalfa sprouts, tender stems, dehydrated leaves as a dietary supplement in forms such as tablets, powders and tea, while animals utilized itin the form of forage, harvested hay and feed (Kundan and Anupam, 2011). This plant is rich in calcium, proteins, alkaloids, mineral elements, vitamins (A, B, C, D, E, K), amylase enzyme, emulcer, invertase, pectinase and phytochemicals like flavonoid and saponin which possess anti-fungal, anti-bacterial and insecticidal properties that defence against pathogens (Farsani *et al*.,2016; Moses *et al*., 2014).

Damage of crops due to insects, bacteria, fungi and viruses with economic losses of world crop production estimated as 12% (Horbach *et al*., 2010). *Fusarium*s pp., are considered as an important plant pathogen known to produce toxins and wilting in plant cell membrane (Garces de Granada *et al*., 2001; Pawar and Thaker, 2007). *Rhizoctonia solani* is responsible for causing root rot and damping off diseases on a numerous variety of crop plants

(Abu-Taleb *et al*., 2011). *M. phaseolina* produces charcoal rot and seedling blight and decrease in yield production (Wheeler and Rush, 2001; Tanina *et al*., 2004). Different methods such as biological, cultural, physical, chemical, resistant cultivar, soil fumigants and solarisation have been used to control plant pathogens. However, synthetic fungicides have been used to effective management for crop protection from pathogenic fungi infestation (Osman and Al-Rehiayam, 2003). But due to the extensive use of fungicides, there have been negative effects on ecosystems and human health (Stranger and Scott, 2005).Thus; there is a need of alternative control strategies to minimize effect of synthetic fungicides (Mahesh and Satish, 2008). Current study was carried out on antifungal activities of Alfalfa parts (Leaves, flower and fruit) extracts alone and combined treatment with both organic and inorganic fertilizers for the control of soil borne plant pathogenic fungi on okra and cowpea plants.

MATERIALS AND METHODS

Collection of plant parts for extract preparation:

Healthy plants parts (leaves, flower, and fruits) of *Medicago sativa* L. (Alfalfa) were collected from various areas of Karachi (Memon Goath, Saddar and Orangi Town). Plant parts were washed with water and dried under shade and grinded into fine powder. Powder of each part (10g) was soaked in 90 mL of sterilized distilled water and left for overnight. It after filtered through Whatman's No.1 filter paper served as stock solution (100 % w/v).

Preparation of pot experiment:

Soil was sieved to remove unnecessary particles and plants debris. Each plastic pot received 300g soil with three replicates of each treatment. Inorganic fertilizers like (Frutan, Di-ammonium phosphate and urea) at 0.01 and 0.1% w/w concentrations while organic fertilizers such as *Ascophyllum nodosum* (brown seaweed), cow and goat dung at 0.01 and 0.1% w/w was amended in the soil alone and in combination with seeds treated with aqueous extract of leaves, flowers, fruits of *M. sativa* at 100% v/w. Seeds of okra and cowpea were sown in soil of each pot while soil without any treatment was regarded as control. Plants were carefully uprooted after thirty days of germination to record different growth parameters and impact on colonization of root infecting fungi.

RESULTS

Organic and inorganic fertilizers when used as soil amendment remarkably improved growth of okra plants. However, maximum root and shoot lengths and weights were recorded when seeds were treated with leaves extract of *M. sativa* in combination with *A. nodosum* at 0.1% w/w as shown in Table 1. The second highest treatment which improved okra length and weight was leaves extract at 100% w/v in combination with soil amended with 0.1% cow dung. Colonization of root infecting fungi was highly reduced significantly ($P<0.001$) by the addition of organic and inorganic fertilizers in soil. However, complete suppression of *F. oxysporum* and *M. phaseolina* colonization were recorded by soil amended with urea and cow dung at 0.1% w/w and seeds treated with 100% leaves extract of *M. sativa* in the combination with soil amended with 0.1% frutan, urea, *A. nodosum* and cow dung. Combination between seeds treatment with 100 % *M. sativa* and soil amended with urea at 0.1% showed maximum decrease of *R. solani* colonization in okra roots.

Leaves extract of *M. sativa* at 100% w/v concentration combined with organic fertilizers of frutan and urea at 0.1% w/w significantly ($P<0.001$) enhanced length of shoot/root and numbers of nodules of cowpea plants followed by flower and fruit extracts. However soil was amended at 0.1% w/w with Di-ammonium phosphate combined with leaves extracts of *M. sativa* at 100% w/v concentration showed lowest results in term of weight of shoot/ root and length of cowpea roots as compared to other treatments at 0.01% w/w was shown in Table 2. Complete suppression of *F. oxysporum,* and *M. phaesolina* were recorded when seeds were treated with 100 % leaves extract of *M. sativa* in combination with frutan at 0.1 % w/w followed by urea and *A. nodosum* at 0.1 % w/w. However, soil amended with *A. nodosum* at 0.1 % w/w inhibits the colonization of *R. solani* on cowpea roots as compared to other treatments.

Overall result showed that combination of *M. sativa* at 100 %w/v with frutan, urea, *A. nodosum* at 0.1 % w/w not only improved growth but also reduced the colonization of root infecting fungi like *M. phaseolina, F. oxysporum* and *R. solani* in both crops.

Table 1. Effect of seed treatment with Alfalfa parts (leaves, flowers and fruits) extracts along with soil amendment with fertilizers on growth parameters and in the control of root rot fungi of okra plants.

Treatments	Growth parameters				Root rot fungi colonization (%)		
	Shoot length (cm) ± SE	Shoot weight (g) ± SE	Root length (cm) ± SE	Root weight (g) ± SE	*Fusarium* spp. ± SE	*R. solani* ± SE	*M. phaseolina* ± SE
Control (untreated)	15.18±0.47	0.50 ± 0.03	4.23 ± 0.61	0.08 ± 0.00	28.88 ± 2.22	33.33 ± 0.00	31.10 ± 2.22
S.T with Leaves@100%	23.05 ± 1.12	0.69 ± 0.31	6.67 ± 0.26	0.15 ± 0.03	4.44 ± 4.44	13.33 ± 3.85	11.11 ± 5.87
S.T with Flowers @ 100%	20.01 ± 0.43	0.55 ± 0.04	4.86 ± 0.16	0.09 ± 0.01	19.99 ± 3.84	17.77 ± 2.22	15.55 ± 5.87
S.T with Fruits @ 100%	17.97 ± 0.54	0.54 ± 0.13	4.79 ± 0.06	0.08 ± 0.00	28.88 ± 2.22	22.22 ± 2.22	22.21 ± 4.44
S.A with Frutan @ 0.01%	22.50 ± 0.29	1.37 ± 0.05	15.55 ± 1.23	0.28 ± 0.08	8.88 ± 2.22	15.55 ± 4.44	11.10 ± 2.22
S.A with Frutan @ 0.1%	25.23 ± 0.68	1.42 ± 0.10	16.15 ± 1.07	0.36 ± 0.07	2.22 ± 2.22	13.33 ± 0.00	8.88 ± 4.44
S.A with DAP @ 0.01%	21.80 ± 0.41	1.66 ± 0.16	16.40 ± 0.25	0.29 ± 0.04	17.77 ± 4.44	26.66 ± 3.84	15.55 ± 5.87
S.A with DAP @ 0.1%	22.72 ± 2.04	1.79 ± 0.14	16.94 ± 0.17	0.34 ± 0.03	11.10 ± 2.22	15.55 ± 2.22	13.33 ± 3.85
S.A with Urea @ 0.1%	22.91 ± 0.65	1.72 ± 0.08	17.17 ± 0.85	0.35 ± 0.04	2.22 ± 2.22	11.10 ± 2.22	6.66 ± 0.00
S.A with Urea @ 0.1%	23.67 ± 1.61	1.80 ± 0.22	17.63 ± 0.20	0.40 ± 0.01	0.00 ± 0.00	8.88 ± 4.44	4.44 ± 2.22
S.A with *A. nodosum* @ 0.01%	21.71 ± 0.46	1.69 ± 0.10	18.28 ± 0.17	0.30 ± 0.02	4.44 ± 2.22	13.33 ± 0.00	6.66 ± 3.84
S.A with *A. nodosum* @ 0.1%	27.46 ± 0.65	1.79 ± 0.15	18.65 ± 0.71	0.31 ± 0.03	0.00 ± 0.00	8.88 ± 4.44	2.22 ± 2.22
S.A with Cow dung @ 0.01%	20.75 ± 0.26	1.70 ± 0.12	18.49 ± 0.40	0.34 ± 0.00	11.10 ± 2.22	20.00 ± 0.00	8.88 ± 5.88
S.A with Cow dung @ 0.1%	22.55 ± 0.59	1.85 ± 0.17	18.75 ± 0.10	0.36 ± 0.03	0.00 ± 0.00	13.32 ± 6.66	0.00 ± 0.00
S.A with Goat dung @ 0.01%	18.24 ± 1.35	1.41 ± 0.14	17.29 ± 0.81	0.27 ± 0.01	26.66 ± 3.84	24.44 ± 2.22	19.99 ± 6.66
S.A with Goat dung @ 0.1%	19.97 ± 0.14	1.62 ± 0.18	16.31 ± 0.17	0.28 ± 0.04	17.77 ± 2.22	28.88 ± 2.22	24.44 ± 4.44
S.T with Leaves@ 100%+S.A with Frutan @ 0.01%	25.69 ± 0.81	1.96 ± 0.31	17.38 ± 0.96	0.53 ± 0.12	8.88 ± 4.44	22.22 ± 5.87	15.55 ± 2.22
S.T with Leaves@ 100%+S.A with Frutan @ 0.1%	27.34 ± 0.09	2.41 ± 0.08	18.88 ± 0.22	0.63 ± 0.08	0.00 ± 0.00	11.11 ± 5.87	4.44 ± 2.22
S.T with Leaves@ 100%+S.A with DAP @ 0.01%	22.66 ± 1.38	1.56 ± 0.03	15.7 ± 15.7	0.43 ± 0.05	13.33 ± 3.85	15.55 ± 5.87	24.44 ± 4.44
S.T with Leaves @ 100%+S.A with DAP @ 0.1%	22.75 ± 0.75	1.58 ± 0.08	16.64 ± 0.56	0.55 ± 0.04	11.10 ± 2.22	17.77 ± 8.01	22.22 ± 5.87
S.T with Leaves@ 100%+S.A with Urea @ 0.01%	25.13 ± 0.95	1.64 ± 0.15	18.35 ± 1.37	0.52 ± 0.06	8.88 ± 4.44	15.55 ± 2.22	24.44 ± 2.22
S.T with Leaves @ 100%+S.A with Urea @ 0.1%	25.74 ± 0.30	2.17 ± 0.22	19.00 ± 0.28	0.60 ± 0.06	0.00 ± 0.00	6.66 ± 3.84	0.00 ± 0.00
S.T with Leaves@ 100%+S.A with *A. nodosum* @ 0.01%	26.18 ± 0.29	1.56 ± 0.08	18.70 ± 0.83	0.51 ± 0.04	2.22 ± 2.22	15.55 ± 2.22	4.44 ± 2.22
S.T with Leaves@ 100%+S.A with *A. nodosum* @ 0.1%	30.01 ± 0.57	2.92 ± 0.11	22.39 ± 1.36	1.08 ± 0.12	0.00 ± 0.00	11.10 ± 2.22	0.00 ± 0.00
S.T with Leaves@ 100%+S.A with Cow dung @ 0.01%	25.48 ± 0.52	1.51 ± 0.10	11.41 ± 5.07	0.31 ± 0.28	6.66 ± 3.84	13.33 ± 3.85	11.10 ± 4.44
S.T with Leaves @ 100%+S.A with Cow dung @ 0.1%	29.41 ± 0.71	2.35 ± 0.06	19.08 ± 0.39	0.42 ± 0.09	0.00 ± 0.00	8.88 ± 4.44	0.00 ± 2.22
S.T with Leaves@ 100%+S.A with Goat dung @ 0.01%	23.91 ± 0.81	1.47 ± 0.08	14.33 ± 0.94	0.35 ± 0.02	13.33 ± 7.69	26.66 ± 3.84	17.77 ± 2.22
S.T with Leaves@ 100%+S.A with Goat dung @ 0.1%	25.88 ± 0.91	1.85 ± 0.13	13.24 ± 1.29	0.40 ± 0.07	15.55 ± 8.01	24.44 ± 4.44	15.55 ± 2.22
S.T with Flowers@ 100%+S.A with Frutan @ 0.01%	20.70 ± 0.18	1.48 ± 0.06	17.58 ± 0.32	0.52 ± 0.09	13.33 ± 0.00	15.55 ± 4.44	11.10 ± 2.22
S.T with Flowers @ 100%+S.A with Frutan @ 0.1%	23.50 ± 0.74	1.81 ± 0.18	17.73 ± 1.62	0.53 ± 0.05	8.88 ± 4.44	11.10 ± 2.22	8.88 ± 4.44
S.T with Flowers @ 100%+S.A with DAP @ 0.01%	18.85 ± 0.74	1.39 ± 0.15	15.76 ± 0.08	0.42 ± 0.06	24.44 ± 2.22	26.66 ± 6.66	26.66 ± 3.84
S.T with Flowers @ 100% +S.A with DAP @ 0.1%	20.58 ± 1.13	1.43 ± 0.09	17.37 ± 0.77	0.45 ± 0.04	17.77 ± 2.22	19.99 ± 3.84	17.77 ± 2.22
S.T with Flowers@ 100%+S.A with Urea @ 0.01%	20.88 ± 0.41	1.7 ± 0.11	18.01 ± 0.68	0.48 ± 0.10	22.22 ± 2.22	22.22 ± 2.22	17.77 ± 5.87
S.T with Flowers @ 100% +S.A with Urea @ 0.1%	22.50 ± 0.97	1.79 ± 0.07	18.13 ± 0.11	0.52 ± 0.03	11.10 ± 4.44	17.77 ± 2.22	8.88 ± 2.22
S.T with Flowers @ 100%+S.A with *A. nodosum* @0.01%	21.39 ± 1.18	1.53 ± 0.07	16.71 ± 0.30	0.26 ± 0.08	11.10 ± 2.22	17.77 ± 5.88	13.33 ± 3.85
S.T with Flowers @ 100% +S.A with *A. nodosum* @ 0.1%	25.58 ± 0.81	2.28 ± 0.24	19.96 ± 0.98	0.34 ± 0.03	4.44 ± 2.22	13.33 ± 3.85	6.66 ± 3.84
S.T with Flowers@ 100% +S.A with Cow dung @ 0.01%	20.93 ± 0.33	1.52 ± 0.16	12.34 ± 0.21	0.26 ± 0.04	15.55 ± 5.87	13.33 ± 3.85	17.77 ± 2.22
S.T with Flowers @ 100% +S.A with Cow dung @ 0.1%	23.11 ± 0.86	2.00 ± 0.22	15.49 ± 1.07	0.28 ± 0.02	11.11 ± 5.87	17.77 ± 4.44	6.66 ± 3.84
S.T with Flowers@ 100% +S.A with Goat dung @ 0.01%	19.15 ± 0.71	1.42 ± 0.09	12.07 ± 0.93	0.22 ± 0.02	15.55 ± 4.44	19.99 ± 3.84	17.77 ± 2.22
S.T with Flowers@ 100% +S.A with Goat dung @ 0.1%	21.4 ± 0.70	1.71 ± 0.16	12.52 ± 0.84	0.23 ± 0.02	11.10 ± 2.22	13.33 ± 3.85	11.11 ± 5.87
S.T with Fruits@ 100%+S.A with Frutan @ 0.01%	20.46 ± 1.97	1.19 ± 0.06	12.98 ± 1.25	0.28 ± 0.06	20.00 ± 0.00	19.99 ± 3.84	24.44 ± 4.44
S.T with Fruits@ 100%+S.A with Frutan @ 0.1%	21.85 ± 1.21	1.52 ± 0.16	17.72 ± 0.50	0.43 ± 0.05	15.55 ± 2.22	19.88 ± 3.84	17.77 ± 2.22
S.T with Fruits@ 100%+S.A with DAP @ 0.01%	19.29 ± 2.34	1.45 ± 0.16	11.80 ± 0.13	0.30 ± 0.07	22.22 ± 2.22	24.44 ± 2.22	26.66 ± 0.00
S.T with Fruits @ 100% +S.A with DAP @ 0.1%	21.98 ± 1.52	1.49 ± 0.05	12.79 ± 0.28	0.34 ± 0.06	20.00 ± 0.00	24.44 ± 5.87	22.22 ± 2.22
S.T with Fruits@ 100%+S.A with Urea @ 0.01%	20.58 ± 1.00	0.61 ± 0.11	12.67 ± 1.28	0.34 ± 0.02	22.21 ± 4.44	24.44 ± 5.87	26.66 ± 3.84
S.T with Fruits @ 100% +S.A with Urea @ 0.1%	22.25 ± 0.60	1.37 ± 0.08	20.33 ± 0.90	0.38 ± 0.04	11.10 ± 2.22	19.99 ± 3.84	15.55 ± 2.22
S.T with Fruits@ 100%+S.A with *A. nodosum* @ 0.01%	19.19 ± 2.41	1.54 ± 0.06	15.95 ± 0.14	0.48 ± 0.10	15.55 ± 2.22	26.66 ± 3.84	17.77 ± 8.01
S.T with Fruits@ 100%+S.A with *A. nodosum* @ 0.1%	19.87 ± 1.47	1.94 ± 0.42	19.58 ± 0.96	0.24 ± 0.04	13.33 ± 3.85	22.22 ± 5.87	15.55 ± 4.44
S.T with Fruits@ 100%+S.A with Cow dung @ 0.01%	18.57 ± 1.21	1.43 ± 0.14	12.79 ± 1.57	0.37 ± 0.13	17.77 ± 2.22	13.33 ± 3.85	24.44 ± 5.87
S.T with Fruits @ 100%+S.A with Cow dung @ 0.1%	22.83 ± 1.51	1.73 ± 0.29	14.23 ± 1.27	0.25 ± 0.04	13.33 ± 6.66	19.99 ± 3.84	13.33 ± 3.85
S.T with Fruits@ 100%+S.A with Goat dung @ 0.01%	18.06 ± 1.08	1.35 ± 0.14	10.95 ± 0.31	0.19 ± 0.02	19.99 ± 6.66	26.66 ± 6.66	22.21 ± 4.44
S.T with Fruits@ 100%+S.A with Goat dung @ 0.1%	19.03 ± 2.83	1.6 ± 0.16	11.31 ± 0.38	0.19 ± 0.02	15.55 ± 5.87	22.22 ± 2.22	22.21 ± 4.44
$LSD_{0.05}$=	3.08	0.44	2.93	0.20	10.07	11.56	10.96

Where: ±SE= Standard error, S.A= Soil amendment, S.T= Seed treatment.

Table 2. Effect of seed treatment with Alfalfa parts leaves, flowers, fruits) extracts along with soil amendment with Fertilizers on growth parameters and in the control of root rot fungi on Cowpea plants.

Treatments	Growth parameters					Root rot fungi colonization (%)		
	Shoot length (cm)± SE	Shoot weight (g) ± SE	Root length (cm) ± SE	Root weight (g) ± SE	Number of nodules ± SE	*Fusarium* spp. ± SE	*R. solani* ± SE	*M. phaseolina* ± SE
Control (untreated)	14.49 ±1.82	1.19 ± 0.01	10.29 ± 1.02	0.11 ± 0.00	2.88 ± 0.58	22.22 ± 5.87	24.44 ± 2.22	26.66 ± 3.84
S.T with Leaves@100%	18.02 ± 0.88	1.41 ± 0.02	15.24 ± 0.88	0.15 ± 0.01	8.66 ± 0.69	6.66 ± 3.84	15.55 ± 5.87	13.33 ± 6.66
S.T with Flowers @ 100%	17.56 ± 0.46	1.34 ± 0.11	10.20 ± 0.38	0.11 ± 0.01	3.88 ± 0.61	15.55 ± 5.87	22.22 ± 2.22	15.55 ± 5.87
S.T with Fruits @ 100%	14.15 ± 0.68	1.32 ± 0.01	10.34 ± 0.72	0.11 ± 0.02	3.10 ± 0.29	20.00 ± 0.00	22.21 ± 4.44	22.22 ± 2.22
S.A with Frutan @ 0.01%	25.07 ± 0.28	1.49 ± 0.13	17.94 ± 0.97	0.38 ± 0.04	12.11 ± 0.94	19.99 ± 3.84	26.66 ± 3.84	15.55 ± 5.87
S.A with Frutan @ 0.1%	25.74 ± 1.86	1.54 ± 0.19	18.53 ± 1.95	0.39 ± 0.05	13.0 ± 0.98	11.10 ± 2.22	11.10 ± 2.22	8.88 ± 4.44
S.A with DAP @ 0.01%	19.71 ± 1.53	1.35 ± 0.06	16.43 ± 1.02	0.26 ± 0.02	9.11 ± 1.05	17.77 ± 2.22	22.22 ± 2.22	11.10 ± 2.22
S.A with DAP @ 0.1%	20.58 ± 1.05	1.37 ± 0.06	16.84 ± 0.46	0.31 ± 0.08	11.21 ± 0.86	11.10 ± 2.22	22.21 ± 4.44	11.10 ± 2.22
S.A with Urea @ 0.1%	24.38 ± 0.32	1.39 ± 0.09	16.93 ± 0.85	0.35 ± 0.05	12.32 ± 1.45	15.55 ± 4.44	17.77 ± 2.22	11.10 ± 2.22
S.A with Urea @ 0.1%	25.15 ± 2.05	1.41 ± 0.09	17.61 ± 1.95	0.37 ± 0.05	14.33 ± 0.84	8.88 ± 4.44	15.55 ± 2.22	8.88 ± 5.88
S.A with *A. nodosum* @ 0.01%	25.06 ± 0.35	1.84 ± 0.10	19.95 ± 0.63	0.34 ± 0.04	13.55 ± 1.12	11.10 ± 2.22	15.55 ± 2.22	13.33 ± 3.85
S.A with *A. nodosum* @ 0.1%	29.79 ± 0.71	1.94 ± 0.19	20.72 ± 0.68	0.36 ± 0.03	16.14 ± 2.12	2.22 ± 2.22	4.44 ± 2.22	4.44 ± 2.22
S.A with Cow dung @ 0.01%	25.41 ± 0.68	1.70 ± 0.24	19.34 ± 0.19	0.33 ± 0.05	12.99 ± 1.17	8.88 ± 2.22	17.77 ± 2.22	8.88 ± 2.22
S.A with Cow dung @ 0.1%	26.76 ± 0.45	1.75 ± 0.17	20.53 ± 1.00	0.40 ± 0.03	15.21 ± 0.72	4.44 ± 4.44	13.33 ± 0.00	2.22 ± 2.22
S.A with Goat dung @ 0.01%	20.14 ± 1.97	1.50 ± 0.19	17.66 ± 0.30	0.26 ± 0.03	10.55 ± 0.61	24.44 ± 2.22	26.66 ± 3.84	13.32 ± 6.66
S.A with Goat dung @ 0.1%	21.74 ± 0.59	1.69 ± 0.17	17.98 ± 0.27	0.30 ± 0.05	12.88 ± 1.25	22.21 ± 4.44	24.44 ± 4.44	26.66 ± 3.84
S.T with Leaves@ 100%+S.A with Frutan @ 0.01%	29.26 ± 0.55	2.40 ± 0.29	19.72 ± 0.40	0.57 ± 0.07	14.22 ± 1.73	4.44 ± 2.22	11.10 ± 2.22	19.99 ± 3.84
S.T with Leaves@ 100%+S.A with Frutan @ 0.1%	30.37 ± 0.51	2.59 ± 0.11	21.74 ± 0.27	0.67 ± 0.05	20.66 ± 1.17	0.00 ± 0.00	6.66 ± 3.84	2.22 ± 2.22
S.T with Leaves@ 100%+S.A with DAP @ 0.01%	22.88 ± 1.23	1.46 ± 0.10	17.91 ± 0.23	0.47 ± 0.04	12.33 ± 1.26	13.33 ± 7.69	17.77 ± 2.22	15.55 ± 5.87
S.T with Leaves @ 100%+S.A with DAP @ 0.1%	26.48 ± 0.72	1.45 ± 0.08	20.12 ± 0.95	0.56 ± 0.05	16.44 ± 0.55	11.11 ± 5.87	13.32 ± 6.66	15.55 ± 2.22
S.T with Leaves@ 100%+S.A with Urea @ 0.01%	27.86 ± 0.47	1.81 ± 0.13	20.07 ± 1.23	0.54 ± 0.07	16.88 ± 1.06	6.66 ± 3.84	17.77 ± 2.22	13.33 ± 3.85
S.T with Leaves@ 100% +S.A with Urea @ 0.1%	28.71 ± 0.54	2.23 ± 0.22	20.73 ± 0.15	0.66 ± 0.05	19.11 ± 1.45	0.00 ± 0.00	8.88 ± 4.44	0.00 ± 0.00
S.T with Leaves@ 100%+S.A with *A. nodosum* @ 0.01%	28.81 ± 0.27	1.61 ± 0.09	21.49 ± 0.74	0.59 ± 0.10	14.88 ± 1.22	2.22 ± 2.22	13.33 ± 3.85	8.88 ± 2.22
S.T with Leaves@ 100% +S.A with *A. nodosum* @ 0.1%	33.49 ± 1.11	3.07 ± 0.12	25.25 ± 1.46	1.17 ± 0.04	26.33 ± 1.52	0.00 ± 0.00	11.10 ± 2.22	0.00 ± 0.00
S.T with Leaves@ 100% +S.A with Cow dung @ 0.01%	28.05 ± 0.71	1.79 ± 0.18	18.65 ± 1.27	0.40 ± 0.02	14.55 ± 0.94	4.44 ± 2.22	6.66 ± 6.66	11.10 ± 2.22
S.T with Leaves@ 100% +S.A with Cow dung @ 0.1%	32.18 ± 0.87	2.51 ± 0.08	21.38 ± 0.34	0.50 ± 0.08	19.11 ± 0.94	0.00 ± 0.00	8.88 ± 2.22	0.00 ± 0.00
S.T with Leaves@ 100% +S.A with Goat dung @ 0.01%	26.26 ± 0.91	1.54 ± 0.08	17.01 ± 1.01	0.36 ± 0.02	12.55 ± 1.25	22.22 ± 2.22	24.44 ± 5.87	22.21 ± 4.44
S.T with Leaves@ 100% +S.A with Goat dung @ 0.1%	30.16 ± 0.83	2.26 ± 0.10	15.46 ± 1.11	0.47 ± 0.08	13.99 ± 0.50	17.77 ± 5.88	22.22 ± 5.87	17.77 ± 2.22
S.T with Flowers@ 100%+S.A with Frutan @ 0.01%	20.98 ± 3.00	1.65 ± 0.10	13.73 ± 1.64	0.28 ± 0.01	11.55 ± 1.06	15.55 ± 2.22	17.77 ± 4.44	22.22 ± 2.22
S.T with Flowers @ 100%+S.A with Frutan @ 0.1%	26.51 ± 0.61	1.67 ± 0.09	15.24 ± 1.65	0.29 ± 0.01	13.33 ± 0.88	6.66 ± 6.66	15.55 ± 2.22	8.88 ± 2.22
S.T with Flowers @ 100%+S.A with DAP @ 0.01%	21.03 ± 0.80	1.44 ± 0.14	12.35 ± 0.90	0.24 ± 0.04	10.11 ± 1.06	20.00 ± 0.00	26.66 ± 3.84	17.77 ± 2.22
S.T with Flowers @ 100% +S.A with DAP @ 0.1%	24.66 ± 0.21	1.41 ± 0.09	14.03 ± 1.10	0.25 ± 0.02	11.33 ± 0.50	15.55 ± 2.22	22.22 ± 2.22	15.55 ± 2.22
S.T with Flowers@ 100%+S.A with Urea @ 0.01%	23.45 ± 1.43	1.61 ± 0.11	13.74 ± 2.21	0.23 ± 0.01	11.22 ± 0.11	17.77 ± 2.22	15.55 ± 5.87	17.77 ± 2.22
S.T with Flowers @ 100% +S.A with Urea @ 0.1%	24.94 ± 0.90	1.49 ± 0.18	14.42 ± 1.45	0.26 ± 0.00	11.33 ± 0.38	4.44 ± 2.22	22.22 ± 2.22	4.44 ± 4.44
S.T with Flowers @ 100%+S.A with *A. nodosum* @ 0.01%	23.25 ± 1.41	1.82 ± 0.06	19.15 ± 0.19	0.33 ± 0.01	17.44 ± 1.41	4.44 ± 4.44	13.33 ± 3.85	11.10 ± 2.22
S.T with Flowers @ 100% +S.A with *A. nodosum* @ 0.1%	27.63 ± 0.86	2.97 ± 0.17	22.23 ± 0.88	0.39 ± 0.02	20.44 ± 0.29	6.66 ± 3.84	15.55 ± 4.44	4.44 ± 2.22
S.T with Flowers@ 100% +S.A with Cow dung @ 0.01%	22.80 ± 0.28	1.78 ± 0.26	15.57 ± 1.75	0.30 ± 0.02	12.44 ± 0.61	13.33 ± 3.85	22.22 ± 5.87	15.55 ± 4.44
S.T with Flowers @ 100% +S.A with Cow dung @ 0.1%	24.83 ± 0.79	1.80 ± 0.15	17.93 ± 1.44	0.34 ± 0.02	14.66 ± 1.45	4.44 ± 4.44	15.55 ± 2.22	8.88 ± 2.22
S.T with Flowers@ 100% +S.A with Goat dung @ 0.01%	20.82 ± 0.50	1.75 ± 0.14	14.14 ± 1.56	0.25 ± 0.03	10.33 ± 0.69	22.22 ± 5.87	28.88 ± 2.22	24.44 ± 2.22
S.T with Flowers@ 100% +S.A with Goat dung @ 0.1%	22.75 ± 0.71	1.77 ± 0.17	16.57 ± 1.04	0.26 ± 0.05	12.77 ± 0.90	24.44 ± 5.87	26.66 ± 3.84	17.77 ± 8.01
S.T with Fruits@ 100%+S.A with Frutan @ 0.01%	20.26 ± 3.67	1.26 ± 0.06	11.85 ± 1.75	0.25 ± 0.03	9.33 ± 2.71	15.55 ± 5.87	22.21 ± 4.44	15.55 ± 2.22
S.T with Fruits@ 100%+S.A with Frutan @ 0.1%	24.08 ± 1.61	1.62 ± 0.21	13.81 ± 0.80	0.26 ± 0.04	11.77 ± 0.77	13.32 ± 6.66	19.99 ± 6.66	11.10 ± 8.01
S.T with Fruits@ 100%+S.A with DAP @ 0.01%	20.17 ± 1.39	1.41 ± 0.10	11.46 ± 0.87	0.28 ± 0.06	10.21 ± 2.28	22.22 ± 5.87	24.44 ± 2.22	24.44 ± 2.22
S.T with Fruits@ 100% +S.A with DAP @ 0.1%	24.22 ± 4.06	1.44 ± 0.08	12.92 ± 1.36	0.23 ± 0.06	10.10 ± 3.22	19.99 ± 3.84	19.99 ± 3.84	20.00 ± 0.00
S.T with Fruits@ 100%+S.A with Urea @ 0.01%	20.39 ± 2.42	1.45 ± 0.08	12.98 ± 0.66	0.21 ± 0.04	10.77 ± 1.28	17.77 ± 4.44	19.99 ± 6.66	22.22 ± 2.22
S.T with Fruits@ 100% +S.A with Urea @ 0.1%	22.05 ± 1.45	1.45 ± 0.09	13.93 ± 1.07	0.26 ± 0.06	11.77 ± 1.23	13.33 ± 3.85	24.44 ± 5.87	13.33 ± 3.85
S.T with Fruits@ 100%+S.A with *A. nodosum* @ 0.01%	19.57 ± 3.75	.67 ± 0.09	18.82 ± 2.42	0.25 ± 0.11	13.57 ± 2.71	15.55 ± 2.22	22.21 ± 4.44	28.88 ± 2.22
S.T with Fruits@ 100% +S.A with *A. nodosum* @ 0.1%	23.45 ± 1.86	1.45 ± 0.24	19.98 ± 3.13	0.30 ± 0.05	16.88 ± 5.84	11.11 ± 5.87	20.00 ± 0.00	15.55 ± 2.22
S.T with Fruits@ 100% +S.A with Cow dung @ 0.01%	20.18 ± 1.63	1.49 ± 0.14	12.94 ± 2.10	0.25 ± 0.09	10.11 ± 1.15	19.99 ± 3.84	24.44 ± 2.22	31.10 ± 2.22
S.T with Fruits @ 100% +S.A with Cow dung @ 0.1%	21.57 ± 3.40	1.55 ± 0.09	15.00 ± 2.13	0.27 ± 0.06	13.33 ± 0.84	11.11 ± 5.87	24.44 ± 2.22	20.00 ± 0.00
S.T with Fruits@ 100% +S.A with Goat dung @ 0.01%	19.62 ± 0.83	1.41 ± 0.14	12.98 ± 0.91	0.21 ± 0.07	7.44 ± 2.70	22.22 ± 2.22	31.10 ± 2.22	24.44 ± 2.22
S.T with Fruits@ 100% +S.A with Goat dung @ 0.1%	20.69 ± 2.98	1.47 ± 0.21	13.85 ± 0.72	0.22 ± 0.10	11.10 ± 2.14	22.22 ± 5.87	24.44 ± 2.22	22.22 ± 5.87
$LSD_{0.05}$=	4.43	0.40	3.53	0.15	4.36	11.16	10.54	10.26

Where: ±SE= Standard error, S.A = Soil amendment, S.T= Seed treatment

DISCUSSION

Fertilizers play an important role in agriculture system to improve yield and reduced economic losses. Soil amendments considered as a point to enhanced soil health by supplying significant micronutrients (Timsina and Kerconner, 2010). Present results showed that soil amendment with inorganic fertilizers Frutan and urea at 0.1% w/w in combination with seed treatment with leaves extracts of plants like *M. sativa* at 100% concentration improved growth parameters followed by Alfalfa flowers and fruits. When seed treatment with Alfalfa leaves extracts at 100% concentration along with soil amended with organic fertilizers like cow dung and *A. nodosum* 0.1% w/w concentration showed maximum result as compared to goat dung. Similar result reported by Tariq *et al*. (2008) where improvement in plant growth parameters were detected when Furtan, DAP and urea used at 0.1% w/w in combination with *A. marina* leaves powder on okra. It might be possible that the combination of extract and fertilizers improves nitrogen uptake of plants which also increase uptake of Ca, Mg, Na and K (Irshad *et al.*, 2002). Attarde *et al*. (2012) reported that by using of fertilizers (organic and inorganic) in soil presented better plant growth parameters. Akanbi *et al*. (2010) observed that crops yield improved by using inorganic fertilizers and properties of soil like pH and nutrient availability for crop plants.

Complete inhibition in *F. oxysporum, R. solani* and *M. phaesolina* were recorded when seed treatment with Alfalfa leaves extracts at 100% w/v concentration as compared to other treatments. However, when soil was amended with DAP and goat dung at 0.1% and seeds treated with 100% concentration of Alfalfa flowers and fruits showed minimum plant growth parameters and minor reduction of root rot pathogens as compared to other treatments. Jabeen *et al.* (2021) reported that when seed treatment with *Withania somnifera,* and *D. alba* leaves extract at 100% concentration were performed in field experiment showed positive effect against pathogenic fungi and improved the growth as compared to control. Also, Akhter *et al*. (2006) observed that ethanolic extracts of *Adhatoda vasica* and *Zingiber officinale, Piper betle, Azadirachta indica* and *Catharanthus rosens* syn. *Vinca rosea* with cow dung and *Calotropis procera* (leaves) extract along with cow urine possess strong activity to suppress the conidial germination of *Bipolaris sorokiniana*. In the present studies the growth of cowpea and okra plants were enhanced by using plant Alfalfa leaves as a seed treatment with 100% concentration were found to be best and more active in the inhibition of root rot pathogens and highest developments on growth parameters, as compared to 100% concentration of flowers and fruits extracts that gave minimum growth and reduced root infecting fungi on cowpea and okra plants. Similar result was reported by Jabeen *et al*. (2019) in which seed treatment with *W. somnifera* and *D. alba* leaves extract at 100% enhanced maximum plant growth and also inhibit root rot fungi as compared to control. 100% extract of leaves showed phytochemicals and antibacterial activity (Srinivas and Reddy, 2012). Tested leaves extracts showed antifungal properties in the control of root rot pathogens and improved the development of plants. *Senna alata* crude extracts was more active for the decrease in soil borne pathogens than diluted extracts (Suleiman *et al.,* 2008).

CONCLUSION

Present research the confirmed that antifungal properties of *Medicago sativa* plant parts (Leaves, flowers and fruits) against root rot pathogens and enhanced the growth of crop plants. Control of plant pathogens by agrochemicals are expensive and caused harmful effects on soil beneficial microbes. Therefore, by using plants extracts alone and combined amendment with inorganic and organic fertilizers can easily be used against root rot fungal pathogens and recommended as reasonable in agriculture due to their beneficial effect on the growth of plants.

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(*Accepted for publication October 2022*)