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Effect of organic fertilizer on length of pod, biological yield and number of seeds per pod in mung bean (*Vigna radiata* L.)

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ABSTRACT: Mung bean is a warm season crop requiring 90–120 days of frost free conditions from planting to maturity. Adequate rainfall is required from flowering to late pod filling in order to ensure good yield. Organic materials have beneficial effects on fertility and physical properties of soil. Humic acid is an organically charged bio-stimulant that significantly affects plant growth and development and increases crop yield. The experiment was conducted at the University of Zabol. The field experiment was laid out in randomized complete block design with split plot design with three replications. Irrigation intervals (6 day, 9 day, 12 day) allocated to main plots and Organic fertilizer (without Organic fertilizer (control), humic acid, Phosphate fertilized 2, humic acid + Phosphate fertilized 2) was allocated to sub plots. Experimental results showed that the number of seeds per pod was not affected by drought. Analysis of variance showed that drought stress and organic fertilizers had a significant effect on the length of the pod mung bean. Analysis of variance showed that the effect of stress on biological function was highly significant.
Key words: humic acid, mung bean, Phosphate fertilized 2

INTRODUCTION

Mung bean (Vigna radiata L.), commonly known as green gram, is favorite food in Iran and many other countries. It has an edge over other pulses because of its high nutritive value, digestibility and non-flatulent behavior. Mung bean seeds contain 24.7% protein, 0.6% fat, 0.9% fiber and 3.7% ash (Potter and Hotchkiss, 1997). Mung beam is a warm season crop requiring 90–120 days of frost free conditions from planting to maturity. Adequate rainfall is required from flowering to late pod filling in order to ensure good yield. Drought problems for Mug beans are worsening with the rapid expansion of water stressed areas of the world including 3 billion people by 2030 (Postel, 2000). Crop yield of Mung bean is more dependent on an adequate supply of water than on any other single environmental factor (Kramer and Boyer 1997).Intensive farming practices, which produce high yields and quality, require the extensive use of chemical fertilizers that are both costly and create environmental problems. Therefore, there has been a recent resurgence of interest in environmentally friendly, sustainable and organic agricultural practice (Orhan et al., 2006). Therefore, more recently there has been a resurgence of interest in environmentally friendly, sustainable and organic agricultural practices (Esitken et al., 2005). Using of Bio-fertilizers instead of synthetic chemicals is known to improve plant growth through supply of plant nutrients and may help to sustain environmental health and soil productivity (O'Connell, 1992). Organic materials have beneficial effects on fertility and physical properties of soil (Hoitink & Grebus, 1994). The physical properties of soil play an important role in influencing plant growth thereby contributing to efficient crop production (Zheljazkov & Warman, 2004). According to Zia et al. (2000), continuous use of chemical fertilizers even in balanced proportion will not be able to sustain crop productivity due to deterioration in soil health. Application of organic manures or some organic wastes alone was found useful (Ibrahim et al., 1992; Alam and Shah, 2003), but integrated use of organic wastes and chemical fertilizer has proved more rewarding (Mian et al., 1989, Nasir and Qureshi, 1999; Khanam et al. 2001, Alam et al., 2003, 2005). Mulching soil surface with different organic materials improves soil biological activities, retain soil moisture for longer time and helps to control weeds (Saima et al., 2013). Application of organic materials to the soil reduces the dependence on chemical fertilizers and helps microorganisms to produce polysaccharides, which improve the soil conditions (Guar, 1994; Sharif et al., 2003). Humic acid is an organically charged bio-stimulant that significantly affects plant growth and development and increases crop yield. It has been extensively investigated (Nardi et al., 2004) that humic acid improves physical (Varanini et al., 1995), chemical and biological properties of soils (Keeling et al., 2003; Mikkelsen, 2005). The role of humic acid is well known in controlling, soil-borne diseases and improving soil health and nutrient uptake by plants, mineral availability, fruit quality, etc (Mauromicale et al., 2011). Humic acid based fertilizers increase crop yield (Mohamed et al., 2009), stimulate plant enzymes/hormones and improve soil fertility in an ecologically and environmentally benign manner (Mart, 2007; Sarir et al., 2005). The influence of humic material on plant growth have shown that humic substances (HS) enhance root, leaf and shoot growth and also stimulate the germination of various crop species (Piccolo et al., 1993). increased microbiological activities and improved soil structure for sustainable agriculture for further years (Blair et al. 2005; Kundu et al. 2006). However, the proper combination of both organic and inorganic fertilizers have better effects on crop growth and development and yield component of wheat than alone (Budaruddin et al. 1999; Hossain et al. 2002; Manna et al. 2005).

MATERIALS AND METHODS

The experiment was conducted at the University of Zabol (new pardis) which is situated between 52° North latitude and 36° East longitude and at an altitude of 481 m above mean Sea Level. Composite soil sampling was made in the experimental area before the imposition of treatments and was analyzed for physical and chemical characteristics. The field experiment was laid out in randomized complete block design with split plot design with three replications. Irrigation intervals (6 day, 9 day, 12 day) allocated to main plots and Organic fertilizer (without Organic fertilizer (control), humic acid, Phosphate fertilized 2, humic acid + Phosphate fertilized 2) was allocated to sub plots. A week after emergence, seedlings were thinned to maintain two plants per hill. Final thinning was done two weeks after emergence to maintain only one healthy seedling per hill. Final thinning was done two weeks after emergence to maintain only one healthy seedling per hill. Data collected were subjected to statistical analysis by using a computer program MSTATC. Least Significant Difference test (LSD) at 5 % probability level was applied to compare the differences among treatments` means.

Table 1. Soil characteristics of the experiment during 2012 area growing season

Year	Depth of soil (cm)	pH	Ec(ds /m)	N (%)	Ca(ppm)	K(ppm)
2012	0-30	8.16	3.75	4.77mg/lit	11.5	140

RESULTS AND DISCUSSION

The number of seeds per pod

Experimental results showed that the number of seeds per pod was not affected by drought (Table 2). With the increase drought stress was not significant effect on reducing the number of seeds per pod (Table 3). Application of phosphate fertilizers and biological humic acid and the combination of both a significant effect on increasing the number of seeds per pod than did controls (Table 3). To investigate the effects of drought and phosphorus fertilizers on yield, quality little machine also concluded drought and phosphorus fertilizers had no significant effect on the number of seeds per pod.

Table 2. Analysis of Variance characteristics mung bean under the influence of organic fertilizers and irrigation

S.O.V	df	The number of seeds per pod	Length of pod	Biological yield
Replication	2	1582.26^{*}	0.01^{**}	214378.77^{ns}
irrigation	3	476.29^{ns}	1.40	4108196.02^{**}
Error a	4	297.06	0.10	291348.44
organic fertilizers	2	9190.13^{ns}	0.3^{5*}	1148066.39^{**}
interaction	6	205.99^{ns}	0.17^{ns}	248717.73^{ns}
Error b	18	222.50	0.09	98768.37
Cv%	-	12.75	6.12	8.72

ns, (*) and (**) represent not significant and significant difference over control at p<0.05 and p<0.01, respectively

Length of pod

Analysis of variance showed that drought stress and organic fertilizers had a significant effect on the length of the pod mung bean (Table 2). So that irrigation at 12 day courses with the shortest 80.4 legume and non-stress treatment (6 days) with 49.5 had the highest yield (Table 3). It has been reported that reduced water availability, especially at the beginning of pea flowering period, while shortening the vegetative and reproductive stage of growth slowdown and indirectly on the negative effect of high will (Korte et al., 1993). Water restriction during development generative (before maturity), yield and yield components mung bean reduce the time and stress are highly correlated. It has been reported that drought stress in all the mung bean growth Reduced height, number of nodes, number of branches, plant weight, seed number, seed weight, number of pods, pod weight and harvest index.

Table 3. Mean comparison characteristics mung bean under the influence of organic fertilizers and irrigation

Treatments			
organic fertilizers	The number of seeds per pod	Length of pod (cm)	Biological yield (kg/ha)
control	118.40a	5.06ab	3067.3b
Humic acid (h)	115.62a	4.94a	3736.8ab
Phosphate fertilized (f)	117.96a	5.13ab	3825a
H*f	118.73a	5.41a	3772.1ab
irrigation			
6 day	118.76a	5.49a	42.2a
9 day	111.29a	5.11b	3565.6b
12 day	122.70a	4.8c	3033.3b

* Values followed by the same letter within the same columns do not differ significantly at p =1% according to DMRT

Biological yield

Analysis of variance showed that the effect of stress on biological function was highly significant (Table 2). So that the control sample with the highest biological yield of 4202 kg ha irrigation after 12 days with an average of 3.3033 kg per hectare had the lowest Biological yield (Table 3). The plant stress, reduced vegetative development, plant height, number of branches, number of leaves and leaf area were especially. As a result, the ability of photosynthesis and dry matter accumulation rate decreases. Loss of dry matter in the crop due to soil water depletion is caused due to decreased absorption of radiation being emitted or reduced photosynthetic efficiency, or a combination of the two. In general it can be said that the amount of net photosynthesis than well as a reduction in stomatal conductance and chlorophyll content under stress conditions that could lead to the production of smaller amounts of biomass (Liu et al., 2004). One of the important biological function indicators in determining the extent of crop growth (Halaji, 2004). Because the goal of increasing the production of dry matter in plants treated with irrigation, better durability leaf was developed more That cause physiological source for anything more than light enough dry matter was production biological influences vegetative growth period can be if the plant because of the extreme environmental conditions before it can be enough growth If the reproductive phase, its biological function is decreasing (Borraclough, and Kate. 2001).

REFERENCES

Alam SM, Shah SA.2003. Effect of individual versus integrated use of phosphatic fertilizer on P-uptake and yield of maize and wheat. Pak. J. Soil Sci. 22: 74-80.

Badruddin M, Reynolds MP, Ageeb OAA.1999. Wheat management in warm environments: Effect of organic and inorganic fertilizers, irrigation frequency and mulching. Agron. J. 91:975-983.

Blair NR, Faulkner D, Till AR, Poulton PR.2006. Long-term management impacts on soil C, N and physical fertility. Soil and Tillage Res. 91:30-38.

Brannon CA, Sommer LE.1985. Preparation and characterization of model humic polymers containing org. P. Soil Biol. Biochem., 17: 213-219.

Esitken A, Karlidag H, Ercisli S, Turan M, Sahin F.2003.The effect of spraying a growthpromoting bacterium on the yield, growth and nutrient element composition of leaves of apricot (Prunus armeniaca L. cv. Hacihaliloglu). Aust J Agric Res 54: 377- 380.

Guar AC. 1994. Bulky organic manures and crop residues. In: (Ed.): H.L.S. Tandon. Fertilizers, Organic Manures, Recyclable Wastes and bio-fertilizers, pp. 36-51. Fertilizers Development and Consultation Organization, New Delhi, India.

Hoitink HAJ, Grebus ME. 1994. Status of biological control of plant disease with composts. Compost Sci. Utilization., 2: 5-12.

Hossain SMA, Kamal AMA, Islam MR, Mannan MA. 2002. Effects of different levels of chemical and organic fertilizers on growth, yield and protein content of wheat. J. Biol. Sci. 2:304-306.

Ibrahim M, Ahmad N, Rashid A, Saeed M. 1992. Use of press-mud as source of phosphorus for sustainable agriculture. In: Proc. Symp. “Role of Phosphorus in Crop Production”, NFDC, Islamabad, Pakistan. pp. 293-301.

Keeling AA, McCallum KR, Beckwith CP. 2003. Crop and Environment Research Centre, Harper Adams University College, Newport, Shropshire, UK, Bioresource Tech., 90 (2): 127-137.

Khanam M, Rahman MM, Islam MR. 2001. Effect of manures and fertilizers on the growth and yield of BRRI Dhan 30. Pak. J. Biol. Sci. 4: 172-174.

Kramer PJ, Boyer JS. 1997. Water relations of Plants and Soils, Academic Press, San Diago Arrese Gonzalez EM Mariano D Landera R Larraiza E Gil-Quintana E 2009 Physiological response of legume nodules to drought, Plant stress, Global Science book, 5 (special Issue):24-31

Kundu S, Bhattacharyya R, Parkash V, Ghosh BN, Gupta HS.2007. Carbon sequestration and relationship between carbon addition and storage under rainfed soybean-wheat rotation in a sandy loam soil of the India Himalayas. Soil and Tillage Res. 92: 87-95.

Manna MC, Swarup A, Wanjari RH, Ravankar HN, Mishra B, Saha MN, Singh YV, Sahi DK, Sarap PA.2005. Long-term effect of fertilizer and manure application on soil organic carbon storage, soil quality and yield sustainability under sub-humid and semi-arid tropical India. Field Crops Res. 93:264-280.

Mart I. 2007. Fertilizers, organic fertilizers, plant and agricultural fertilizers. Agro and Food Business Newsletter, pp. i-iv.

Mauromicale G, Angela MGL, Monaco AL. 2011. The effect of organic supplementation of solarized soil on the quality of tomato. Scientia Hort., 129 (2): 189-196.

Mian SM, Hassan MM, Salim M. 1989. Comparison of poultry and farmyard manure for improving efficiency of single super phosphate applied to wheat. Pak. J. Agric. Sci. 26: 446-473.

Mikkelsen RL. 2005. Humic materials for agriculture, Davis, California, USA. Better Crops with Plant Food. 89 (3): 6-7.

Mohamed A, Bakry A, Soliman YRA, Moussa SAM.2009. Importance of micronutrients, organic manure and bio-fertilizer for improving maize yield and its components grown in desert sandy soil. Res. J. Agric. & Bio. Sci., 5 (1): 16-23.

Nardi S, Pizzeghello D, Pandalai SG.2004. Rhizosphere: A communication between plant and soil. Recent Res. Development in Crop Sci., 1 (2): 349-360.

Nasir NM, Qureshi MA. 1999. Response of sugarcane to bio-compost prepared from filter cake and silage. Pak. J. Soil Sci. 16: 75-80.

O'Connell PF.1992. Sustainable agriculture—a valid alternative. Outlook Agric 21: 5-12.

Orhan E, Esitken A, Ercisli S, Turan M, Sahin F.2006. Effects of plant growth promoting rhizobacteria (PGPR) on yield, growth and nutrient contents in organically growing raspberry. Sci Hort 111: 38-43.

Piccolo A, Celano G, Pietramellara G.1993. Effects of fractions of coal-derived humic substances on seed germination and growth of seedlings (Lactuga sativa and Lycopersicum esculentum). Biol Fertil Soils 16: 11-15.

Postel SL. 2000. Entering an era of water scarcity: The challenges ahead. Ecological Applications, 10: 941-948

Potter NN, Hotchkiss JH.1997. Food Science. CBS Publishers, New Delhi, India pp 403

Saima H, Khan Bahadar M, Muhammad S, Muhammad H, Muhammad W, Shahfahad. 2013. Developing a sustainable and eco-friendly weed management system using organic and inorganic mulching techniques. Pak. J. Bot., 45(2): 483-486.

Saima H, Khan Bahadar M, Muhammad S, Muhammad H, Muhammad W, Shahfahad. 2013. Developing a sustainable and eco-friendly weed management system using organic and inorganic mulching techniques. Pak. J. Bot., 45(2): 483-486.

Sarir MS, Sharif M, Ahmed Z, Akhlaq M. 2005. Influence of different levels of humic acid application by various methods on the yield and yield components of maize. Sarhad J. Agric., 21 (1): 75-81.

Sharif M, Khattak RA, Sarir MS.2003. Residual effect of humic acid and chemical fertilizers on maize yield and nutrient accumulation. Sarhad. J. Agric., 19(4): 543-550.

Varanini Z, Pinton R, Behnke HD, Luttge U, Esser K, Kadereit JW, Runge M. 1995. Humic substances and plant nutrition. Progress in Botany: Structural botany, physiology, genetics and taxonomy. Geobotany, 56: 97-117.

Zheljazkov VD, Warman PR. 2004. Source separated municipal solid waste compost application to Swiss Chard and Basil. J. Environ. Quality, 33: 542-552.

Zia MS, Mann RA, Aslam M, Khan MA, Hussain F. 2000. The role of green manuring in sustaining rice-wheat production. In: Proc. Symp. "Integrated Plant Nutrition Management", NDFC, Islamabad, Pakistan. pp. 130-149.