Indian Journal of Fundamental and Applied Life Sciences ISSN: 2231– 6345 (Online)
An Open Access, Online International Journal Available at www.cibtech.org/sp.ed/jls/2014/04/jls.htm
2014 Vol. 4 (S4), pp. 2913-2916/Mehraban
Research Article

STUDY OF ORGANIC AND INORGANIC FERTILIZERS ON GERMINATION AND SEEDLING GROWTH OF WHEAT

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ABSTRACT
In order to Study of organic and inorganic fertilizers on germination and seedling growth of wheat, an experiment was conducted as factorial in randomized complete block design with three replications in Zahedan, Iran, 2013. Treatments of organic and inorganic fertilizers were composed of: 100% manure, 100% chemical fertilizer, 50% manure + 50% chemical fertilizer and control as the first factor and micro nutrient elements were composed of: Iron sulfate, Zinc Sulfate, Magnesium Sulfate and control as the second factor in this experiment. In this research were measured factors of the percentage of germination, coleorhiza length, coleoptile length, fresh and dry weight of coleorhiza and coleoptile, and also seed yield. The results showed that fertilizer proportions and micro nutrients had significant effect on all measured factors. The highest amount of wheat seedling characteristics obtained from treatment of 100% chemical fertilizer, and combination of 50% manure + 50% chemical fertilizer with $FeSO_4$.

Keyword: *Fertilizers, Growth, Seedling, Wheat*

INTRODUCTION
Wheat is the staple food of all populations around the world also in Iran's people use wheat as daily life food. Human being used wheat grain and wheat straw has some good nutrients for animal food (Soleimani, 2006). The potential of wheat can only be fully exploited by judicious use of inputs, proper plant protection measures and sufficient irrigation at critical stages, because of this, agricultural scientists are engaged in establishing an agricultural system which can lower production cost and conserve the natural resources.
Therefore, recent interest in manuring has reemerged because of high prices of inorganic fertilizers and the importance of green, farmyard and other types of organic manures that provide long term soil productivity besides meeting nutrient requirements becomes obvious (Abbas *et al.*, 2012). Sustainable agricultural productivity might be achieved through a wise use of integrated nutrient management. It enhanced plant growth, water, and soil and land management. Integrated soil nutrient management increased the crop yield and insufficient amount of these nutrients. Integrated soil management has an implication on agricultural sustainability because it increases soil fertility and productivity. Farmyard manures have a high potential to boost up crop growth combined with chemical fertilizer (Khan and Khalil, 2014).
The use of organic materials in combination with inorganic fertilizers to optimize nutrient availability to plants is a difficult task as organic materials have variable and complex chemical nature. This requires the understanding and knowledge about the chemical composition, particularly the nutrient content and C quality of organic materials and its interaction with inorganic nutrient sources. Unfortunately, there has been little synthesis of the integrated effects of organic materials on net nutrient management. Various trials have compared the yields from inorganic fertilizer, organic material and combination of organic and inorganic fertilizers.
In many situations combination of organic and inorganic fertilizers have produced higher yields than alone (Blackshaw, 2005; Zahoor, 2014).
Abd-El-Wahab (2008) stated that micronutrients such as iron, manganese and zinc have important roles on plant growth traits.
The present investigation was carried out to evaluate the effects of manure and chemical fertilizers on seedling characteristics of wheat in Zahedan region, Iran.

MATERIALS AND METHODS

This experiment was carried out in Zahedan (Iran) as laboratory at 2012. The site lies at longitude 60º51' E, and latitude 29º30' N and the altitude of the area is 1385 m above sea level. The experiment was conducted as factorial in randomized complete block design with three replications. Treatments of organic and inorganic fertilizers were composed of: 100% manure, 100% chemical fertilizer, 50% manure + 50% chemical fertilizer and control as the first factor and micro nutrient elements were composed of: Iron sulfate, Zinc Sulfate, Magnesium Sulfate and control as the second factor in this experiment. For measuring seedling growth characteristics, the seeds of wheat were surface sterilized with 3% formaldehyde for 10 minutes and washed several times with distilled water. 25 healthy and uniform sized seeds selected and sown at equal distance in a petri dish lined with filter paper. Seeds were treated under different concentration solutions of manure and fertilizers. 10 ml of test solution was added to each petri dish and kept inside the germination cage. The petri dishes were kept moist b regularly adding 5 ml of test solution. The petri dishes were covered with a net and kept under room temperature and light condition. At the last after seedling growth, seed germination characteristics such as the percentage of germination, coleorhiza length, coleoptile length, fresh and dry weight of coleorhiza and coleoptile were measured. Finally, the data collected were statically analyzed for variance using SAS software. The mean values were compared by applying Duncan's multiple range test at 5% proability level.

RESULTS AND DISCUSSION

Results

According to results of variance analysis, treatments of fertilizer and micro nutrients had significant effect on the percentage of germination, coleorhiza length, coleoptile length, dry weight of coleorhiza and coleoptile, but theirs interaction effect wasn't significant on these factors (Table 1). The results of data mean comparison show that the most amount of the percentage of germination, coleoptile length, fresh and dry weight of coleorhiza and coleoptile obtained from treatment of 100% chemical fertilizer (Table 2). Nevertheless wasn't see significant different between treatments of 100% chemical fertilizer with 50% chemical fertilizer + 50% manure for factors of fresh and dry weight of coleorhiza and coleoptile (Table 2). Also the highest of coleorhiza length was achieved from treatment of 100% chemical fertilizer (Table 2).

Table 1: Variance analysis of measured factors

						Mean square	
Treatment	**Replication**	**Fertilizer**	**Error a**	**Micro nutrients**	**Interaction effect**	**Error b**	**CV (%)**
Df	2	3	6	3	9	24	-
Germination percentage	0.42 ^{ns}	0.24*	0.84	1.73*	0.71 ^{ns}	1.21	7.85
Coleorhiza length	87.53 ^{ns}	12.51*	5.20	7.82*	11.09 ^{ns}	3.82	3.25
Coleoptile length	1.98 ^{ns}	9.22*	2.02	7.23*	10.21 ^{ns}	3.74	4.56
Dry weight of coleorhiza	0.0010 ^{ns}	0.09*	0.004	0.0112*	0.0097 ^{ns}	0.17	7.11
Dry weight of coleoptile	0.0014 ^{ns}	0.0016*	0.004	0.0010*	0.017 ^{ns}	0.10	9.12

**, ** significant at the 5% and 1% levels of probability respectively and ns (non-significant).*

In this experiment, the lowest amount of all factors measured (the percentage of germination, coleorhiza length, coleoptile length, fresh and dry weight of coleorhiza and coleoptile) obtained from control

treatment as well as (Table 2). Interrace treatments of micro nutrients the most amounts of mentioned factors obtained from obtained from treatment of Iron sulfate ($FeSO_4$) (Table 2). But for coleorhiza dry weight wasn't see significant different between treatments of Iron sulfate ($FeSO_4$) with Magnesium Sulfate ($MgSO_4$) (Table 2). Also In this experiment, the lowest amount of the percentage of germination, coleorhiza length, coleoptile length, dry weight of coleorhiza and coleoptile obtained from control treatment (Table 2).

Table 2: Mean comparison of measured factors

Treatment	Germination percentage (%)	Coleoptile length (cm)	Coleorhiza length (cm)	Dry weight of coleoptile (g)	Dry weight of coleorhiza (g)
Fertilizer proportions					
100% manure	88.37 b	6.41 b	7.22 c	0.165 b	0.183 b
100% chemical fertilizer	98.51 a	7.21 a	9.06 ab	0.199 a	0.208 a
50% manure + 50% chemical fertilizer	95.32 ab	7.00 a	9.39 a	0.189 a	0.197 a
Control	80.22 c	5.13 c	6.85 c	0.083 c	0.107 c
Micronutrients					
$FeSO_4$	98.17 a	7.38 a	9.34 a	0.192 a	0.204 a
$ZnSO_4$	91.67 b	6.00 b	8.05 b	0.163 b	0.182 b
$MnSO_4$	93.29 ab	6.73 ab	8.96 ab	0.163 b	0.197 a
Control	82.09 c	4.99 c	7.14 c	0.125 c	0.136 c

Mean followed by similar letters in each column, are not significant at the 5% level of probability.

Discussion

These results show that use of chemical fertilizer is effective on improvement of germination and seedling growth of wheat. The research results of Chaudry *et al.*, (2007) showed that base plant nutrition with chemical fertilizers caused to wheat seed germination characteristics improvement and plant yield increase. Since crops that in their growth duration, nutrients elements for them was supplied well, these crops produce seeds with higher vigor. So these seeds have higher germination rate and percentage. In this experiment was seen that with increase of chemical fertilizers application would improve wheat seeds germination characteristics (see table 2). Mentler *et al.*, (2002) stated that application of chemical fertilizers and manure as mixed increase vegetative growth and forage yield of corn.

Generally, use of micronutrient elements in crop growth duration as indirect can be effective on seed germination characteristics. These elements because of biochemical effect on physiologic process in crop growth duration can to improve nutrient matters content in seeds. So these elements led to increase of matter accumulation amount in seeds, and improve seeds germination rate and percentage in plants (Babaeian *et al.*, 2011). Abd El-Wahab (2008) reported micronutrients; especially Fe and Zn have important roles in plant growth and yield. They stated micronutrients, especially Fe and Zn which act as metal components of various enzymes and are also associated with photosynthesis and protein synthesis and Iron has important functions in plant metabolism, such as activating catalase enzymes. So iron, manganese and zinc have important roles in growth and yield of plants. Stewart *et al.*, (2005) reported that average percentage of yield attributable to fertilizer generally ranged from about 40 to 60% in the USA and England and tended to be much higher in the tropics. Although, micronutrient elements are needed in relatively very small quantities for adequate plant growth and production, their deficiencies cause a great disturbance in the physiological and metabolic processes in the plant (Bacha *et al.*, 1997).

Conclusion

The results gained in this research showed use of chemical fertilizers is effective on wheat seed germination traits improvement, so that the most amount of these traits obtained from chemical fertilizer complete consumption. However for some traits such as coleoptile length, dry weight of coleoptile and

dry weight of coleorhiza between this treatment with treatment of 50% manure + 50% chemical fertilizer there isn't any significant different. Hence with due attention to these results for decreasing production expenses, preventing bioenvironmental pollutions and also preserving optimum germination, consumption of 50% manure + 50% chemical fertilizer is recommendable for region. Also among micro nutrients, $FeSO_4$ fertilizer than $ZnSO_4$ and $MnSO_4$ fertilizers had more influence on wheat seed germination traits.

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