

Effects of organic composts on yield and protein content of corn cultivars in Khash region

Hamid Reza Ganjali*, Hamid Reza Mobasser and Afsaneh Esmailzahi and Abolfazi Tavassoli

Department of Agriculture, Zahedan Branch, Islamic Azad University, Zahedan, Iran

Corresponding author: Hamid Reza Ganjali

ABSTRACT: In order to study of effect of organic composts on yield and protein content of corn cultivars, an experiment was carried out in 2011 in Sohrabad research center located in east north of Khash. The experimental design was split plot, using randomized complete block design with three replications. The factors included were, main factors: without consumption of compost (S_0), consumption of 200 kg/ha of chicken organic compost (S_1), consumption of 200 kg/ha of fish organic compost (S_2), consumption of 900 kg/ha of cow organic compost (S_3) and three sub factors: single cross 704 (V_1), Keniz (V_2), Maxima (V_3). The results indicated that consumption of organic composts leads to a significant increase in plant height, seed yield and biological yield; however it hadn't significant effect on protein content of corn. Also interaction effect of organic composts application and corn cultivars had significantly effect on plant height, seed yield, biological yield and protein content of corn. Generally, in this experiment the highest corn yield obtained from treatment of cow organic compost application and single cross 704 cultivar.

Keywords: Organic composts, Yield, Corn.

INTRODUCTION

Corn (*Zea mays*) belongs to the wheat family (*Poaceae*) and it grows in warm climates. Corn is one of the five most important crop plants in the world; furthermore, high production potential of this plant reduces the high consumption of chemical reservoirs (Jahan et al., 2009). Use of organic composts is essential in order to create stability in the soil and increase agricultural production (Laegreid et al., 1999). The types of soil in dry and semi-dry areas in Iran usually lack organic matter which results in reduction of fertility and lack of ideal chemical and physical characteristics in these types of soil. Therefore researchers have carried out extensive research on use of organic human composts such as sewage and city waste compost in order to increase agricultural production and its problems. The research showed that adding organic matter to the soil – depending on the type of organic matter and its characteristics- leads to different chemical, biological and physical characteristics in the soil and in most cases ideal condition can be provided to produce agricultural products with high quality and quantity (Cecil and Tester, 1990).

The organic composts create less environmental pollution than chemical composts due to their positive biological effect and modification of physical and chemical characteristics of the soil because their nutrients are released slowly to be used by the plant (Roe et al., 1997).

Fallah et al., (2006) carried out an experiment and concluded that organic composts such as sewage and city waste compost and cow waste increase the yield and yield components of corn, so that there was a significant increase in leaf area index, plant height and 1000-seed weight and seed yield.

Mohamadian and Malakouti, (2003) evaluated effects of two types of compost on characteristics of soil and yield of corn and reported that consumption of chemical compost together with organic compost led to higher yield in comparison with use of chemical compost alone.

Majidian et al, (2005) carried out an experiment on effects of Nitrogen and organic compost on yield and parts of yield of seed corn and explained that organic resources such as organic compost together with chemical

compost can lead to higher fertility of soil and increase in production of agricultural products because this system provides most of plant's nutritional needs and increases the efficiency of absorption of nutrients by plant.

Organic farming is ways to intensify ecological procedures and maintenance of water and soil resources. The goal of doing this research is to evaluate effects of cow, chicken and fish compost on yield and yield components in Khash region.

MATERIALS AND METHODS

In order to study of effect of organic composts on yield and yield components of corn cultivars, an experiment was carried out in 2011 in Sohrababad research center. The site lies at longitude 68°12', and latitude 28°13' and the altitude of the area is 1410 m above sea level. It has a warm dry climate. The soil characteristics of Agriculture Research Center is sandy loam in texture, pH= 7.7 and EC= 1.9 dS.m⁻¹.

The experimental design was split plot, using randomized complete block design with three replications. The factors included were, main factors: without consumption of compost (S₀), consumption of 200 kg/ha of chicken organic compost (S₁), consumption of 200 kg/ha of fish organic compost (S₂), consumption of 900 kg/ha of cow organic compost (S₃) and three sub factors: single cross 704 (V₁), Keniz (V₂), Maxima (V₃).

The cultivation operation was carried out on June 2011. Each part was consisted of 5 rows with a distance between the rows (75 cm). Furthermore the distance between the each plant was 20 cm and the length of each plot was 5 meter and its width was 4 meter. The distance between each part was 0.5 meter and the distance for each replication was 1 meter.

Irrigation was done every 6 days and during the growth season it was done based on the needs of plant and measurement of soil humidity. In the stage of complete ripening, 10 plants were selected randomly and factors such as plant height, seed yield, biological yield and protein content were measured. Data analysis was done using MSTAT-C software and mean comparison was implemented using Duncan test.

RESULTS AND DISCUSSION

Plant height

Based on variance analysis table (Table 1), effects of different levels of organic composts on plant height in statistical level of 1% is significant.

The most plant height belongs to the cow compost with 209 cm whereas fish and chicken compost did not show any significant difference in the plant height (Figure 1). The research showed that compost increases photosynthesis in the plant which consequently leads to increase in growth of air organs and plant's yield; however it might not have a significant effect on root growth or it might even reduce the root growth (Shirani et al., 2009).

The highest and shortest plant height was achieved from cultivars of single cross 704 (209 cm) and Maxima (174 cm) respectively (Figure 2).

The interaction effect of organic composts and cultivars on the plant height was significant in the statistical level of 5% (Table 1). So that cow compost and single cross 704 cultivar had the highest plant height (238 cm) and the shortest plant height was observed from control treatment and maxima cultivar (Figure 3).

Table 1. Variance analysis of factors under study

SOV	df	plant height (cm)	Seed yield (ton/ha)	Biological yield (ton/ha)	Protein (%)
		Mean squares			
Repetition	2	165.796 n.s	n.s 0.001	8.161n.s	0.486 n.s
Organic compost	3	1658.437**	0.179*	35.517*	0.561 n.s
Error a	6	135.172	0.369	5.804	0.161
Cultivar	2	3882.128**	15.927**	10.679*	0.651 **
Organic compost xcultivar	6	393.105*	3.679*	5.434n.s	0.263*
Error b	16	102.145	1.090	4.333	0.088
C.V%		5.24	12.30	8.77	3/01

* and ** significant at 5% and 1% levels of probability respectively

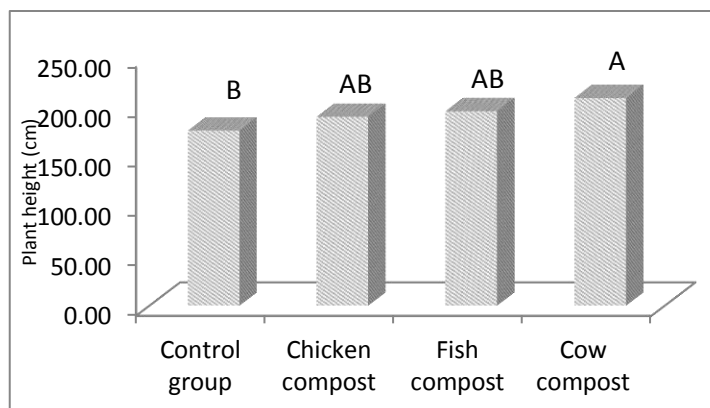


Figure 1. Mean comparison of plant height in different levels of compost

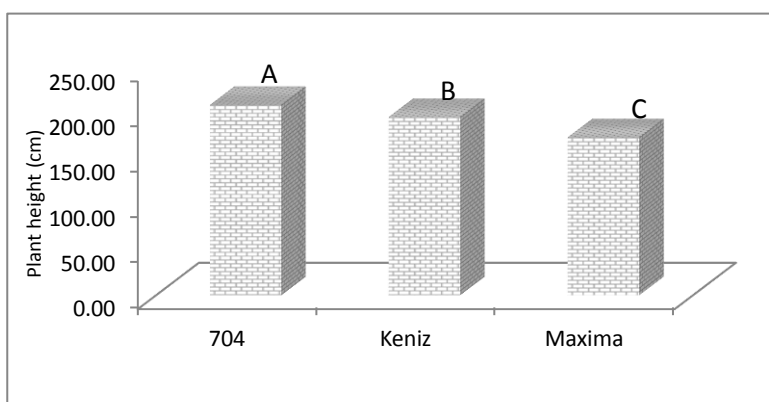


Figure 2. Mean comparison of corn cultivars on plant height

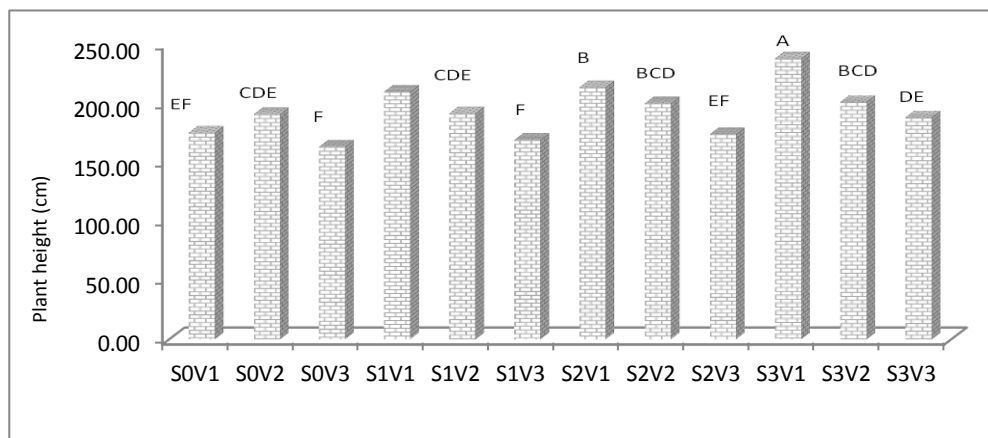


Figure 3. Mean comparison of interaction effect of compost and cultivars treatments on Plant height

Seed yield

The results of variance analysis table showed that organic composts had significant effect on corn seed yield in statistical level of 5% (Table 1).

Although, effects of organic compost (Chicken, fish and cow) on yield did not lead to any statistical differences, nevertheless the highest seed yield relates to the consumption of cow compost which was 8.861 ton/ha, and the lowest seed yield was achieved from control treatment (Figure 4). Evanylo, (2000) and Chastain, (2001) reported that mixing livestock compost with soil has a positive effect on increase of mineralization of Nitrogen and increase of plant yield.

The corn cultivars under study affected seed yield significantly in statistical level of 1% (Table 1). So that the most seed yield obtained from cultivars of single cross 704 and Keniz that was equal to 9.379 and 8.897 ton/ha respectively (Figure 5).

Interaction effect of organic compost and corn cultivars under study were significant in statistical level of 5% on seed yield (table 1). So that the most seed yield (11.268 ton/ha) belonged to cow compost and single cross 704 cultivar (Figure 6).

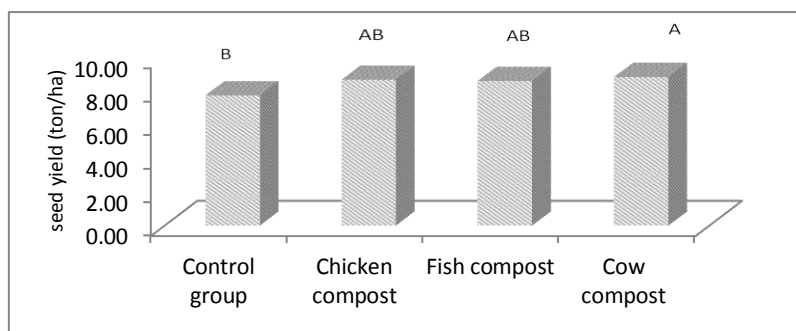


Figure 4. Mean comparison of different types of compost on seed yield

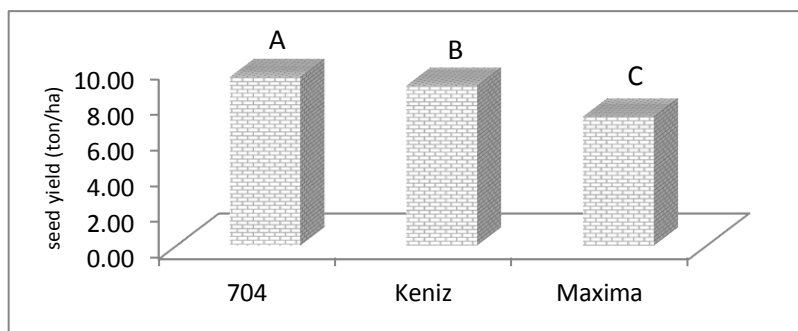


Figure 5. Mean comparison of corn cultivars on seed yield

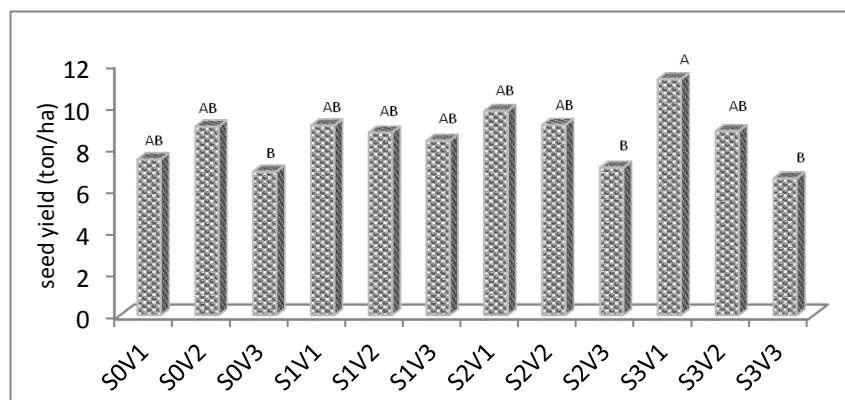


Figure 6. Mean comparison of interaction effect of compost and cultivars treatments on seed yield

Biological yield

The variance analysis shows that organic composts and cultivars treatments had a significant effect on biological yield in statistical level of 5% (Table 1). According to mean comparison of data, the highest biological yield is relevant to cow compost which produced 25.70 ton/ha and the lowest yield is relevant to control treatment, without consumption of compost, which is 21.22 ton/ha (Figure 7).

Shirani et al., (2002) reported that cow compost has a positive effect on increase of seed yield. Results of research by Fallah et al., (2010) showed that adding chicken compost to soil hasn't any significant effect on biological yield. Interrace cultivar treatments the highest amount of produced biomass obtained from cultivar of single cross 704 (Figure 8).

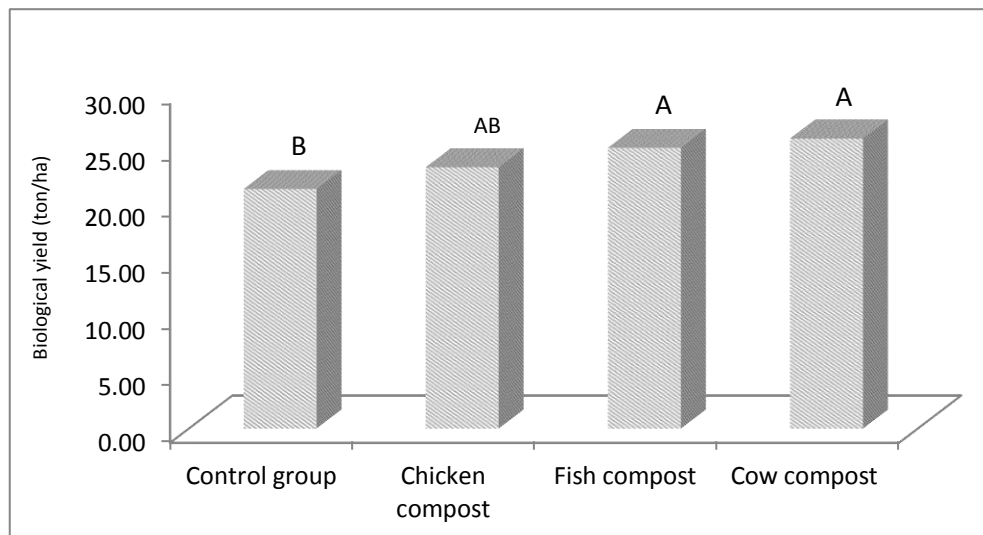


Figure 7. Mean comparison of different types of compost on biological yield

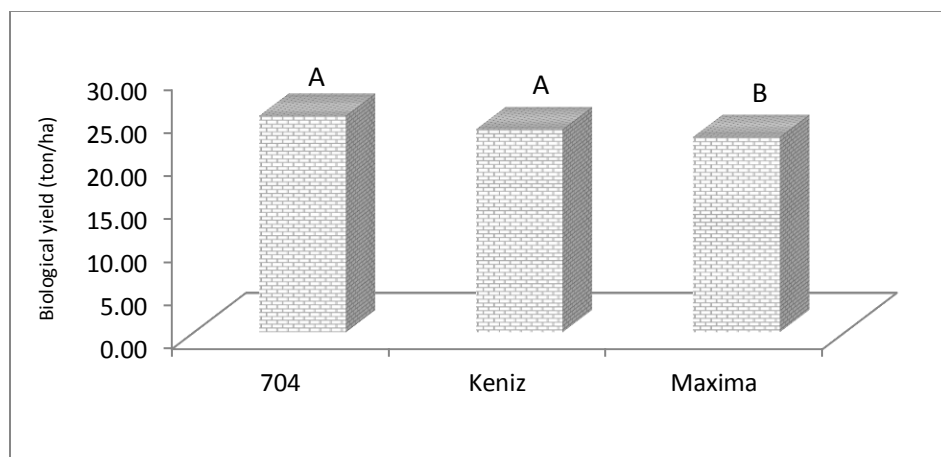


Figure 8. Mean comparison of cultivars treatment on biological yield

Protein content

The results of variance analysis show that organic composts and interaction effect of organic compost and cultivar hadn't any significant effect on corn protein content, but effect cultivars was significant on this factor (Table 1). Mean comparison of cultivars treatment showed that the most and lowest protein content obtained from cultivars of single cross 704 and Maxima that was equal to 4.97% and 3.32% respectively (Table 2).

Table 2. Mean comparison of cultivars treatment on protein content of corn

Cultivar Treatment	Protein content %
single cross 704	4.97 a
Keniz	4.11 b
Maxima	3.32 c

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

REFERENCES

- Cecil F and Tester CF. 1990. Organic amendment effects on physical and chemical properties of a sandy soil. *J. Soil Sci. Soc. Am.* 54: 827-831.
- Chastain JP, Camberato J J and Aibrecht J E. 2001. Nutrient content of livestock and poultry manure. Literature Review. North Carolina Agricultural Extension Service Fact Sheet AG-439-5. November 2001.
- Evanylo GK. 2000. Organic nitrogen decay rates. In: *Managing nutrients and pathogens from animal agriculture (NRAES-130)*. pp. 319-333. Natural Resource, Agriculture, and Engineering Service, Cooperative Extension, 152 Riley-Robb Hall, Ithaca, NY, 14853-5701.
- Fallah A, Ghalavand VM and Khajepour R. 2006. effects of blending method of livestock compost with soil and mixing it with chemical compost on yield and parts of yield of seed corn in Khorramabad, Lorestan, *agricultural and natural resources science magazine*, number 40, p 233-242.
- Fallah A, Ghalavand VM and Khajepour R. 2010. Effects of method mixing livestock compost with soil and chemical compost on yield and parts of yield of seed corn in Khorramabad, Lorestan, *magazine of agricultural and natural resources science and techniques*, p 69-97.
- Jahan M, Koochaki AR, Ghorbani R, Rajali F, Ariyayi M and Ebrahimi A. 2009. effects of use of organic composts on some agro-ecological characteristics of corn in common agricultural and ecological systems, *Iranian agricultural research magazine*, volume 7, part 2, p 376-377.
- Laegreid M, Bockman OC and Kaarstad O. 1999. *Agriculture, fertilizers and the environment*. CABI publishing in Norsk Hydro, ASA.
- Majidian M, Ghalavand A, Kamakar Haghghi A and Karimian N. 2005. effects of dryness, chemical compost, Nitrogen and organic compost on Chlorophyll meter, yield of seed and parts of yield of seed corn type single cross 704, Thesis of PhD in agriculture, Agriculture university, teachers' education university.
- Mohammadian M and Malakouti J. 2003. evaluation of effects of two types of compost on physical and chemical characteristics of soil and yield of corn. Editors: Malakouti, m, J and Gheybi, M,N, *Fundamentals of corn nutrition*, Sana publication, Tehran, p 281-290.
- Roe NE, Stoffella J and Greated D. 1997. Compost from various municipal solid wastes feed stocks affect vegetable crops. II. Growth, yield and fruit quality. *J. Amer. Soc. Hort. Sci.* 122:433-437.
- Shirani H, Hajabasi MA, Afyuni M and Hemmat A. 2002. Effect of farmyard manure and tillage systems on soil physical properties and corn yield in central Iran. *Soil and Tillage Research* 68:101-108.