



**Full Length Article**

## Effect of Broiler Litter on Physical Properties, Growth and Yield of Two Cultivars of Cantaloupe (*Cucumis melo*)

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### ABSTRACT

Effect of broiler litter on physical properties, growth and yield of two cultivars of cantaloupe (*Cucumis melo* L.) was evaluated. The rates of broiler litter were 0, 5, and 10 t ha<sup>-1</sup> and cantaloupe cultivars were "Semsouri" and "Shahabadi". Broiler litter significantly influenced all characteristics except specific gravity. Cultivar behaved differently to rates of broiler litter for total yield, fresh weight of leaves and stem and plant height. For both cultivars the total yield increased nonlinearly with increase in fresh weight of leaves and stem ( $R^2 = 0.91$  &  $0.65$  for Semsouri & Shahabadi, respectively). The interaction between cultivar and broiler litter for "Shahabadi" and "Semsouri" treatments significantly affected seasonal (7 harvests) average weight.

**Key Words:** Cantaloupe; Broiler litter; Growth; Physical properties; Yield

### INTRODUCTION

Cantaloupe (*Cucumis melo* L.) is a very good source of vitamins A, C and  $\beta$ -carotene and can be used as fresh, dried and juice fruit. The world's total production of cantaloupe is  $27 \times 10^6$  tons per year. In Iran, the soil and climatic are ideal for cantaloupe production and it is cultivated on  $8 \times 10^4$  ha with an annual production of  $122 \times 10^4$  tons (Rashidi & Seyfi, 2007; FAOSTAT, 2006). Major part of this is used domestically with only a small quantity exported (Behbahani, 2005).

The physical characteristic of the fruits, as well as serving classification purpose, affect industrial processing and consumer acceptance. The fruit characteristics depend above all on genetic factors and environmental conditions; their interaction giving rise to a particular phenotype and quality, which is defined using different chemical and physical parameters (Valverde *et al.*, 2006). Studies of the physical properties of other fruits have shown the influence upon them of geographic origin, type of fertilization, cultivation conditions and cultivar (Ackurt *et al.*, 1999; Aydin, 2002; Valverde *et al.*, 2006). The physical properties of six cultivars of cantaloupe such as dimension, weight flesh thickness and area of fruit were measured by Liu *et al.* (2004). Norton *et al.* (1985) compared five cultivars of cantaloupe and measured yield, number of fruits at acre and fruit weight. Artes *et al.* (1993) characterized four of the most widely produced cultivars of muskmelon in Spain using the quality factors at harvest such as weight, shape, peel, thickness and firmness.

Fertilizer plays an important role among the environmental influences on crop production (Rashid & Khan, 2008). However with increasing chemical fertilizer costs, cantaloupe growers are seeking alternative cultural practices that reduce production costs without reducing fruit yield or quality (Studstill *et al.*, 2006). Animal manures contain all the essential micro and macro elements required for plant growth. Application of up to 60 tons of dry weight manure increased yield in corn that decreased with further increase of manure (USDA, 1979). Abou-Hussein *et al.* (2003) reported that potato tuber yield and specific gravity increased with combined application of cattle manure and chicken litter.

Pervez *et al.* (2000) verified that specific gravity and yield of potatoes increased by using combined farmyard manure and potassium. Al-Moshileh and Motawei (2007) reported that leaf area, number of tubers and marketable yield of potato were promoted by the rate of chicken litter. Work conducted in Brazil showed that cattle manure significantly increased yield and mean fruit weight of melon (Faria *et al.*, 2003). Little work into the effect of application of organic manure on physical characteristics and yield of cantaloupe has been reported. Present paper examines the effect of broiler litter on yield, growth and physical properties of two Iranian cultivars of cantaloupe.

### MATERIALS AND METHODS

**Experimental details.** The experiment was conducted in the Agricultural and Natural Resources Researches Center

of Isfahan (51° 51' E, 32° 41' N, 1545 m above sea level) in 2007. The climate of the region is semi-arid with mean annual precipitation of 190 mm, most of the rain falling between 110 and 120 and mean annual temperature of 26°C with maximum of 42°C in summer and a minimum of 10°C in winter. The experiment was designed as a randomized complete block split plot arrangement with four replications. Two common cultivars of cantaloupe in Iran i.e., “Semsouri” and “Shahabadi” were selected and assigned to main plots. Three levels of the broiler litter (0, 5 & 10 t ha<sup>-1</sup>) were allocated to subplots.

**Soil and broiler litter.** The initial soil properties prior to the experiment are shown in Table I. Broiler litter obtained from a nearby Poultry Farm Station was analyzed and had on a dry weight basis EC 3.40 ds m<sup>-1</sup>; pH 8.75; O.C 26.24%; total N 23 g kg<sup>-1</sup>; P 142.4 g kg<sup>-1</sup> and K 205.2 g kg<sup>-1</sup>. Physico-chemical analysis of soil of experimental area and chemical composition of broiler litter indicated that the soil was poor in N and organic matter, while the broiler litter was an overfilled source of these elements (Table I). It was computed that 1000 kg of broiler litter contained 23 kg of N and assumed that 50% it was available for the plant (Studstill *et al.*, 2006).

**Crop management.** Broiler litter was applied at pre-sowing stage on a dry weight basis in plots as per treatments and incorporated in the soil with spade during field preparation. The distance of mounds with two planted rows was 150 cm and plant population was 1.3 plant m<sup>-2</sup>. The crops were planted with 24 plots (5 m × 6 m) at the end of April and were harvested at the middle of July. The extra flowers were eliminated by hand one week after the flowering and only two or three flower on each plant were maintained (Shin *et al.*, 2007). The fruits were randomly selected from middle rows in each plot. Furrow irrigation, which is common in the studied region, was applied at the flow rate of 1.4 L s<sup>-1</sup> at weekly intervals.

**Physical properties and growth.** The major diameter (a), minor diameter (b) and height (h) of each fruit were measured to 1.0 mm by a caliper. Geometric mean diameter (GMD) was calculated as suggested by Mohsenin (1986):

$$GMD = (abh)^{1/3} \quad (1)$$

Samples mass (M) was measured by using a digital balance with a sensitivity of 0.01 g. Volume (V) and specific gravity (S.G) were measured by the liquid displacement method. Toluene (C<sub>7</sub>H<sub>8</sub>) was used, rather than water, because water is absorbed by the fruits (Mohsenin, 1986; Sitkei, 1986).

The growth was expressed as plant height, fresh weight of leaves and stem (W<sub>LS</sub>), total and marketable yield (Villanueva *et al.*, 2004). Season average weight of fruits (S.A.W) as another important parameter for each treatment was determined in seven stages by the following relation:

$$S.A.W = \frac{\text{Weight of fruits}}{\text{Number of fruits}} \quad (2)$$

**Statistical analysis.** The statistical analysis was performed using PROC ANOVA in SAS (Version 8.02 SAS Institute, 2001). Treatment means were separated using the Least Significant Difference (LSD) test. Differences were considered significant only when p values were lower than 0.05.

## RESULTS AND DISCUSSION

Results indicated significant differences amongst the rates of broiler litter (BL) and the cultivars for various plant traits in these studies (Table II). Semsouri cv. exhibited higher W<sub>LS</sub> and plant height than those recorded for cv. Shahabadi. The total yield was 38.40 and 28.67 t ha<sup>-1</sup> in “Shahabadi” and “Semsouri”, respectively. The broiler litter was different significantly in all characteristics except of S.G. and higher amount of each attribute observed at 10 t ha<sup>-1</sup> broiler litter. There was a non-significant difference for yield for 5 t ha<sup>-1</sup> and control (Table II). Present study also confirm the findings of (Faria *et al.*, 2003; Fernandes *et al.*, 2003; Studstill *et al.*, 2006), where in plants receiving higher broiler litter rate had significantly greater season marketable yield than those receiving no BL. This maybe explained owing to release of more nutrients in high broiler litter application enhancing the growth and yield of cantaloupe.

Different cultivars behaved differently to the application rates as was depicted by the significant (p<0.05) difference in total yield, fresh weight of leaves and stem and plant height (Fig. 1). Both cvs. with 10 t ha<sup>-1</sup> BL was yielded highest, whereas plant height and fresh weight of leaves and stem was also recorded highest at this rate of BL application in these cvs. This subject matter was included in the observation made by Gharib *et al.* (2008), where they reported organic fertilizers have beneficial effects on plant growth and dry matter yield due to hormonal stimulation of root development and by supplying combined nitrogen. Total yield (Ty) plotted against fresh weight of leaves and stem (WLS) revealed that it increased nonlinearly with increase in WLS (Fig. 2).

Variations in the seasonal average weight (S.A.W) are presented in Fig. 3. The interaction between cultivar and broiler litter for Shahabadi and Semsouri treatments significantly affected season (7 harvests) average weight (p<0.05). The highest S.A.W was recorded for Shahabadi with 10 t ha<sup>-1</sup> BL. Increasing of broiler litter lead to increase of S.A.W from first to fourth harvests and decreased thereafter for Shahabadi cv. But for Semsouri S.A.W

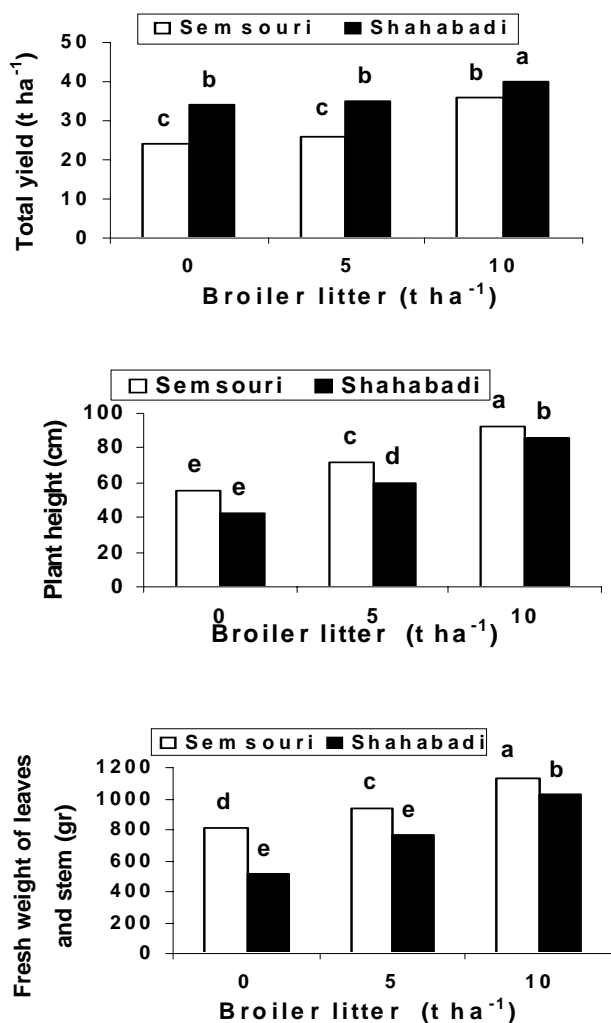
**Table I. Initial soil properties at 0–30 cm soil layer**

Properties	Values
Texture	Clay loam
pH (1:2.5, soil:water)	7.65
EC (dS m <sup>-1</sup> )	1.06
Total soil organic C (g kg <sup>-1</sup> )	0.40
Total N (g kg <sup>-1</sup> )	0.8
Available P (mg kg <sup>-1</sup> )	31.17
Available K (mg kg <sup>-1</sup> )	195

**Table II. Effects of broiler litter on some physical properties, growth and yield of cantaloupe**

Treatments	GMD (cm)	Weight (gr)	Volume (cm <sup>3</sup> )	S.G (gr cm <sup>-3</sup> )	Total yield (t ha <sup>-1</sup> )	Marketable Yield (t ha <sup>-1</sup> )	W <sub>LS</sub> (gr)	Plant height (cm)
<b>Cultivar</b>								
“Semsouri”	11.70 b	697.15 b	1084.90 b	0.65 b	28.67 b	22.74 b	959.79 a	73.42 a
“Shahabadi”	13.12 a	1272.60 a	1409.81 a	0.91 a	38.40 a	28.92 a	769.58 b	69.92 b
<b>Broiler litter (t ha<sup>-1</sup>)</b>								
0	11.80 c	866.19 c	1108.31 b	0.76 a	29.16 b	21.26 c	665.25 c	49.25 c
5	12.33 b	968.00 b	1221.43 b	0.78 a	30.46 b	24.14 b	849.69 b	66.12 b
10	13.10 a	1120.42 a	1412.31 a	0.79 a	39.97 a	32.10 a	1079.12 a	89.12 a

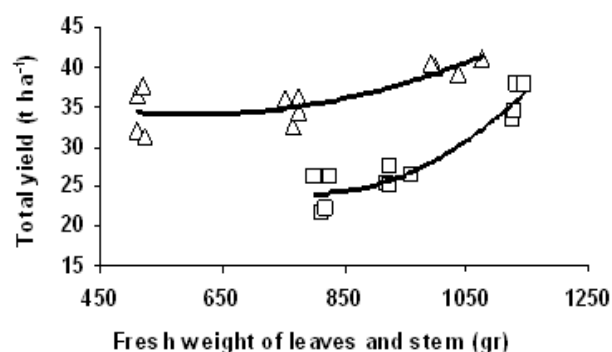
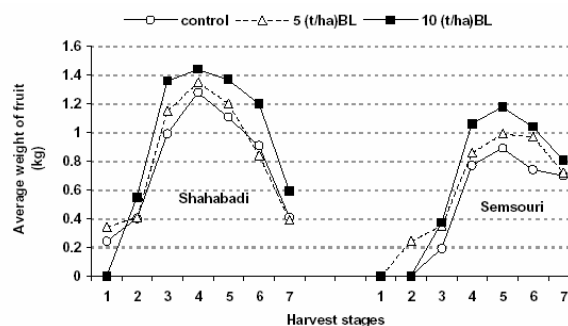
Means followed by different letters within columns within each group are significantly different based on the L.S.D. value

**Fig. I. Effect of broiler litter on growth and total yield of cantaloupe**

increased from 1 to 5 harvests and then decreased. For Shahabadi cv. fruit number in fourth and fifth harvests was the same but weight of fruit in fourth stage was more than fifth stage, so S.A.W obtained highest value in fourth stage. Semsouri cv. recorded the same fruit number in fourth and fifth harvests but weight of fruit in fifth stage was more than fourth stage, so S.A.W obtained highest value in fifth stage.

## CONCLUSION

It can be concluded that physical properties, growth

**Fig. II. Association between total yield and fresh weight of leaves and stem for “Semsouri”(□) and “Shahabadi”(Δ)****Fig. III. Season average weight of fruits in seven harvests. BL: Broiler litter**

and yield of the cantaloupe cultivars (Semsouri & Shahabadi) were affected with broiler litter application and response was better at higher rate of broiler litter. Broiler litter should be applied as an organic fertilizer to get increased cantaloupe production of superior quality.

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