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## Effects of Different Planting Frequency to Some Agricultural Traits of Bitter Melon (*Momordica charantia* L.) Grown in Rize Ecological Conditions

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### Abstract

This trial was established in research and practice garden in Faculty of Agriculture and Natural Sciences according to randomized complete block design with three replications in 2013. Bitter melon (*Momordica charantia* L.) seedlings grown in viols in the greenhouse were planted to land at different frequencies (70x50 cm, 70x100 cm, 70x150 cm) on 20 May, 2013. The harvest started on August 12 and ended on September 18. Measurements for in each fruit harvested were made. In the study, from fruit characteristics, fruit ratio without seed and seed coat, seed ratio, seed weight and seed coat ratio in fruit and, from seed characteristics, seed length, width, depth and 1000 seed weight; from yield components, the fruit yield, fruit yield per plant, single fruit weight per plant, number of fruits per plant and fruit length were determined. According to the results obtained from the research, the highest fruit yield per unit area was obtained from planting distance of 70x50 cm. In addition, the values obtained from the same planting distance in terms of fruit weight, fruit weight and fruit ratio without seed and seed coat, seed length, seed width and seed depth were higher than the one's which obtained from other planting distances.

**Keywords:** Bitter melon, agricultural traits, yield, seed

### Rize Ekolojik Şartlarında Yetiştirilen Kudret Narında (*Momordica charantia* L.) Dikim Sıklığının Bitkinin Bazı Tarımsal Özelliklerine Etkisi

#### Özet

Deneme, 2013 yılında Ziraat ve Doğa Bilimleri Fakültesi Araştırma ve Uygulama Bahçesinde Tesadüf Blokları Deneme Desenine göre 3 tekrarlamalı olarak kurulmuştur. Serada viyoller içinde yetiştirilen Kudret Narı fideleri 20.05.2013 tarihinde farklı sıklıklarda (70x50 cm, 70x100 cm, 70x150 cm) araziye dikilmiştir. Hasat, 12 Ağustos'da başlamış ve 18 Eylül'de sona ermiştir. Araştırmada meyve özelliklerinden iç meyve oranı, meyvede tohum oranı, meyvede tohum ağırlığı ve meyvede kırmızı örtü oranı; tohum özelliklerinden tohum uzunluğu, tohum genişliği, tohum derinliği ve 1000 tohum ağırlığı; verim unsurlarından meyve verimi, bitkide meyve verimi, bitkide tek meyve ağırlığı, bitkide meyve sayısı ve meyve uzunlukları belirlenmiştir. Araştırmadan elde edilen sonuçlara göre 70x50 cm dikim mesafesinden birim alandan en yüksek meyve verim elde edilmiştir. Bununla birlikte aynı dikim mesafesinden meyve ağırlığı, iç meyve ağırlığı, meyve iç oranı, tohum uzunluğu, tohum genişliği ve tohum derinliği bakımından elde edilen değerler, diğer dikim mesafelerinden elde edilen değerlere göre daha yüksek çıkmıştır.

**Anahtar Kelimeler:** Kudret narı, agronomik özellikler, verim, tohum

## Introduction

Bitter melon (*Momordica charantia* L.) is a climber belonging to *Cucurbitaceae* family. The plant is cultivated throughout tropics, particularly in India, China, East Africa, Central and South America (El-Gengaihi et al., 2007). The bitter melon probably originated in China or India (Janssens et al., 2002). There are a lot of local names of *Momordica charantia* L. all over the world. Bitter melon, bitter cucumber, bitter guard, balsam pear, balsam apple, fu kwa, nigai uri, ampalaya, kerala and goo-fash are a few of these local names (Raj et al., 1993; Space ve Flynn, 2000; Janssens et al., 2002). Its name varies according to the region in Turkey and it is known as Kudret Narı, Pelinsenk, Acayip Elması, Mucize Elması and Papara (Sarı et al., 2010; Şanlı, 2006).

Bitter melon normally is grown as an annual crop, but can perform as a perennial in mild-winter areas (Janssens et al., 2002). It is a warm season crop with wide adaptability. Ideal temperature for its growth and flowering is 25-30°C. Crop can be grown even in places of slightly lower temperature and high rainfall areas. Production of female flowers, fruit set and growth of plant are seen affected above 35°C and will be susceptible to viral infections. As seeds have a hard seed coat, germination is affected below 10°C. Well drained and fertile sandy loam or silt loam is ideal for the crop (B. Sc Agriculture, 2014).

The plants, fast-growing which can be about 6-9 m height, are very thin structure and monocious. Male and female flowers are on the same plant and color of their flowers are yellow. Plants illustrate a strong tendency to form the male flowers (Raj et al., 1993).

The studies conducted in our country about cultivation techniques of bitter melon, a valuable medicinal plant reported its benefits in the treatment of many diseases in traditional folk medicine, has remained quite limited.

Objective of this research was to determine the effects of three different planting frequency to some agricultural traits of bitter melon.

## Materials and Methods

This research was carried out during 2013 vegetation period in research and practice garden in Faculty of Agriculture and Natural Sciences (FANS), Recep Tayyip Erdoğan University (RTEU). The Pazar district has a climate displaying fresh summer, moderate winter and rainfall in every season.

According to the records of the Turkish State Meteorological Servis, the District's Long-term average precipitation is 1978.1 mm; long-term

average of growing season (April-October) is 1100.1 mm (TSMS, 2013).

Bitter melon minimum temperature required for germination of seeds (18 °C) coincides with the May. However, in this study, seedlings grown in the greenhouse before were transplanted to the field in May and thus earliness has been provided.

In this research, the bitter melon seeds in inventory of FANS in RTEU were used as the plant material. Seedlings grown in viola in the greenhouse in April-May period were planted to trial field 24 seedlings in each plot in different planting distances (1,5 x 0,7 cm, 1,0 x 0,7 cm and 0,5 x 0,7 cm) on 28 May, 2013.

Experimental area had a soil texture with clay-loam, limeless and non saline. Of the experimental soil, the potassium content was high, but phosphorus and nitrogen contents were insufficient and the pH was below 5. Considering the results of soil analysis, 7 kg NPK (15-15-15)/da and 100 kg agricultural lime/da was applied before the planting.

After transplanting the seedlings were taken to the rope at a height of 2 m. Maturing fruits reaching to color of orange were harvested by hand and the necessary measurements have been made. Experiments were carried out in randomized block design with 3 replications. Variance findings was performed analysis on experimental by using JMP (BSAR Inst., 2006) software and LSD test was applied to test the significance of differences among means.

## Results

In this study, the fruits maturing were collected by counting and the data belonging to traits were recorded separately for each plant. Harvest started on 12 August, 2013 and continued until on 18 September.

The data of agronomic characteristics obtained from the research were presented in Table 1. While differences between values from planting distances in terms of number of fruits per plant and fruit yield per plant were found significant ( $P < 0.01$ ), that from planting distances in terms of fruit yield was found significant ( $P < 0.05$ ). In addition the differences between the values obtained from planting distances were statistically insignificant with regard to fresh fruit length, single fresh fruit weight per plant, fresh fruit weight without seed and seed coat, seed length, seed width, seed depth and 1000 seed weight.

Depending on the planting distances, number of fruits per plant varied between 10,8 and 20,2. While the lowest values were determined in

from 0,5 x 0,7 cm and 1,0 x 0,7 cm, the highest value was calculated for 1,5 x 0,7 cm.

The highest fruit yield per plant was obtained from planting distance of 1,5 x 0,7 cm with 1.552,7 g but the lowest value was 703,8 g per plant. In the other hand the highest fruit yield per decare was determined in from planting distance of 0,5 x 0,7 cm while the values obtained from 1,5 x 0,7 cm and 1,0 x 0,7 cm were same statistically.

In addition, the values obtained from the same planting distance in terms of fruit weight, fruit weight and fruit ratio without seed and seed coat, seed length, seed width and seed depth were

higher than the one's which obtained from other planting distances.

Comparison of the planting distances in terms of some fruit traits has been seen in Table 2. In terms of planting distances of 1,5 x 0,7 cm, 1,0 x 0,7 cm and 0,5 x 0,7 cm, fresh fruit ratios without seed and seed coat were 80,7 %, 83,4 % and 83,9 % respectively. Seed coat ratios were 12,5 %, 9,4 % and 10,0 % while seed ratios were 6,9 %, 7,2 % and 6,1 % respectively. The differences between the values obtained from planting distances were statistically insignificant with regard to these fruits.

**Table 1.** Comparison of the planting distances in terms of some agronomic traits

Agronomic traits	Planting distances			LS
	1,5 x 0,7 cm	1,0 x 0,7 cm	0,5 x 0,7 cm	
Number of fresh fruits per plant (adet)	20,2 a	12,5 b	10,8 b	**
Fresh fruit yield per plant (g)	1.552,7 a	1.039,9 b	703,8 c	**
Fresh fruit yield (kg/da)	1.478,7 b	1.485,5 b	2.011,0 a	*
Fresh fruit length (cm)	13,3	13,0	13,0	-
Single fresh fruit weight per plant (g)	75,3	80,8	68,5	-
Fresh fruit weight without seed and seed coat (g)	88,6	85,1	98,5	-
Seed length (mm)	12,4	12,7	13,3	-
Seed width (mm)	7,00	6,97	7,28	-
Seed depth (mm)	3,73	3,38	3,53	-
1000 seed weight (g)	166,0	173,7	172,3	-

LS: Level of Significance; \* P<0.05; \*\* P<0.01; Means with the same letter in the same line are not statistically significant different from each other according to the LSD test

**Table 2.** Comparison of the planting distances in terms of some fresh fruit traits (%)

Fruit Traits	1,5 x 0,7 cm	1,0 x 0,7 cm	0,5 x 0,7 cm	Average
Fresh fruit weight without seed and seed coat	80,7	83,4	83,9	82,7
Seed coat	12,5	9,4	10,0	10,6
Seed	6,9	7,2	6,1	6,7

## Discussion

Bitter melon grows from lowland areas to altitudes of up to 1.000 m. In addition bitter melon requires a minimum temperature of 18 °C during early growth, but optimal temperatures are in the range of 24–27 °C (Palada and Chang, 2003). The Pazar district has favorable climatic conditions for the plant. In the other hand bitter gourd tolerates a wide range of soils but prefers a well-drained sandy loam soil that is rich in organic matter. Although the optimum soil pH is 6,0–6,7 for its adaptation, the plant can be grown succesfully in soil conditions of Pazar which has acid characters.

The fresh fruit yield increased with decreasing the planting distance in present study and reached the highest value (2.011,0 kg/da) in the lowest density, 0,7x0,5 m of plant distance. But in a research, compared to planting density of 14.286 (1,4x0,5 m), 9.500 (1,4x0,75 m), 7.143 (1,4x1,0 m), 11.111 (1,8x0,5 m), 7.407 (1,8x0,75 m)

and 5.555 (1,8x1,0 m), fruit yield increased with increasing plant density and reached to 2,090 kg/da (Simona and Hălmăgean, 2007). Plant spacing of 50 cm to 1 m between plants and 2-3 m between rows are used in Australia. Optimum plant density varies with cultivar, from 6.500 to 11.000 plants/ha or 20.000 plants/ha (Morgan and Midmore, 2002).

In the other hand, Catedral and Mamicpic (1975), indicated that the ratio of male flowers increased, compared to that of female flowers in the frequent planting conditions. This increase in rate resulted from a sharp decline in the number of female flowers per plant. In current study, number of fresh fruits per plant decreased significantly with planting distance of 70x50 cm. In spite of decrease the number of fruit per plant, more fruit per unit area was obtained in the end.

In addition, the contrast among these values obtained from different planting density

could be resulted from growing techniques, genetic and environmental factors.

### Conclusion

According to the results obtained from the research, the highest fresh fruit yield per unit area was obtained from planting distance of 70x50 cm, although number of fresh fruits per plant and fresh fruit yield per plant decreased with this distance. However, planting distances had not an impact statistically on other fruit and seed traits examined in the research. In the light of the results of one-year study, planting distance of 70x50 cm can be suggested in cultivation of bitter melon.

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