

**NOTE**

**A COMPARISON OF YIELD AND VITAMIN C  
CONTENT OF A LOCAL AND THREE HYBRID  
PEPPER CULTIVARS UNDER A PLASTIC  
TUNNEL**

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**ABSTRACT**

Four cultivars of pepper (*Capsicum annuum* L.) (three hybrids namely 'Belcoln F1', 'Predi F1' and 'Csa'vo'zott F1' and a local cultivar) were compared for yield and vitamin C contents, under a plastic tunnel in the humid climatic condition of Guilan province, Iran. This experiment was arranged in a complete randomized block design with four replications. The hybrid cultivars showed a 10 to 30 % increase in early yield, as compared to the local cultivar, however, the differences were not significant. In the beginning of the summer, when the plastic covering of the tunnel was removed, the local cultivar started to compensate its delay in yield and showed a better production rate as compared to 'Predi F1' hybrid. The local cultivar showed a 25% increase in yield ( $P < 0.05$ ) compared to hybrid cultivars. The overall production rate at the end of the experiment showed that the local cultivar can be cultivated under plastic tunnel conditions without significant difference in yield as compared with the hybrids. The local cultivar showed a higher vitamin C content than the hybrids. The vitamin C content of the local cultivar was twice in comparison to 'Csa'vo'zott F1' hybrid ( $P < 0.01$ ).

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## تحقیقات کشاورزی ایران

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### مقایسه عملکرد و میزان ویتامین C یک رقم محلی و سه رقم

### دو رگه فلفل سبز در زیر تونل پلاستیکی

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### چکیده

چهار رقم فلفل سبز (*Capsicum annuum* L.) (سه رقم دو رگه به نام های 'Belcoln F1'، 'Predi F1' و 'Csa'vo'zott F1' و یک رقم محلی) از نظر عملکرد و میزان ویتامین C در زیر تونل پلاستیکی در شرایط هوای مرطوب استان گیلان، ایران، مقایسه شدند. این آزمایش به صورت طرح بلوک های کامل تصادفی با چهار تکرار انجام شد. ارقام دو رگه، در مقایسه با رقم محلی، ۱۰ تا ۳۰ درصد افزایش در عملکرد اولیه، قبل از برداشتن پلاستیک تونل نشان دادند، اما این تفاوت ها از نظر آماری معنی دار نبود. با شروع تابستان هنگامی که پوشش پلاستیکی تونل برداشته شد، رقم محلی توانست دیر محصول دادن خود را جبران کند و حتی تولید بیشتری در مقایسه با دو رگه 'Predi F1' داشته باشد. عملکرد کلی در پایان آزمایش نشان داد که رقم محلی می تواند در شرایط تونل پلاستیکی کاشته شود بدون اینکه در مقایسه با ارقام دو رگه از نظر عملکرد تفاوت معنی داری داشته باشد. میزان ویتامین C در رقم محلی بیشتر از ارقام دو رگه و دو برابر رقم 'Csa'vo'zott F1' بود.

## INTRODUCTION

Pepper (*Capsicum annuum* L.) has a special place among vegetables consumed in Guilan province, north of Iran. The major crops in this province are rice and tea. Production of vegetables including pepper, in growing season is very limited. The use of plastic tunnel to extend the production period and grow vegetables out-of-season, is well documented (4, 5, 18). However, solanaceous crops have been little studied (3, 13, 19). Pollination and fruit set of plants are impaired by continuous daily temperatures above 30°C, or temperature extremes of 40-50°C in a very short duration (1, 8, 10, 11, 15).

An increase in vitamin C content during ripening of the pepper fruits from green to red and green to yellow has been reported (2, 7, 14, 15, 17). An investigation on the cultivation of the local cultivar under a plastic tunnel was carried out and a comparison was made between this cultivar and three hybrid cultivars for yield and vitamin C content.

## MATERIALS AND METHODS

Four different cultivars of peppers were compared for the yield and vitamin C contents in a plastic tunnel at the College of Agriculture, University of Guilan, Rasht, Iran in 1995 and 1996. The experiment was arranged in a complete randomized block design with four treatments (three hybrid cultivars, namely, 'Belcoln F1', 'Predi F1', 'Csa'vo`zott F1', and a local cultivar) and four replications.

The seeds of all four cultivars were sown on October 16, 1995 in a seed tray, which contained equal proportions of composted manure, one part of a silty textured soil and sand. The seedlings were transferred to 11×11 cm plastic pots at two leaf stage. The seedlings were then transplanted at the four-leaf stage in a space of 50×50 cm under a plastic tunnel on December

21, 1995. The tunnel was a round arch tunnel with steel construction having 2.5 m height, 9.0 m width, 57 m length and covered with 60  $\mu$ m thickness PE plastic films. The tunnel had a natural ventilation, a hot-air oil heater and a chimney to remove the burned gasses. The temperature of plastic tunnel was 22-23°C during the days and 18-19°C at nights. The relative humidity was maintained at 70-75%. All plants were treated alike for cultural practices. The fruits were harvested every 7-10 days and the yield of 10 plants in 2.5 m<sup>2</sup> for each cultivar in four replications was statistically analyzed. Because of presence of a long harvesting period in Guilan, the yield was separately analyzed as early production from April 3 to June 17, 1996, when the tunnel was covered with plastic (consisting of 8 times of harvest) and from June 27 to November 4, 1996 when the plastic cover was removed (consisting of 13 times of harvest). The means were compared using LSD test.

The vitamin C (ascorbic acid) content was measured 6 times (three times under plastic and three times after removal of the plastic) for different cultivars by indophenol method (16). Fruit caps and seeds were removed and the remaining pericarp tissue was sliced and ground in 10 ml of distilled water. To each 5 ml of the extract, 45 ml acetic acid and orthophosphoric acid reagent were added and titrated by 2,6-dichlorophenolindophenol in presence of 2-3 drops of phenol phthalein. The amount of vitamin C of each sample was determined in extracts in mg 100 g<sup>-1</sup> fresh weight of fruit pericarp tissue.

## RESULTS AND DISCUSSION

The results indicated that there were differences in yield and vitamin C content among cultivars (Tables 1 to 4). It is evident from Table 1 that among the cultivars, the hybrids showed an increase in early yield by 11-36% compared to the local cultivar. However, the differences in early yield was not statistically significant.

In Table 2, the mean yield of different cultivars is shown after the removal of plastic covering.

*A comparison between yield...*

Table 1. Early yield means of four pepper cultivars grown under plastic tunnel (spring 1996).

Cultivars	Relative percentage	kg 2.5 m <sup>-2</sup>
'Belcoln F1'	116	4.07 <sup>†</sup>
'Predi F1'	111	3.89
'Csa'vo'zott F1'	136	4.75
Local	100	3.50

<sup>†</sup> LSD 5% = 2.290.

Table 2. Mean yields of four pepper cultivars after removal of plastic cover (summer, 1996).

Cultivars	Relative percentage	kg 2.5 m <sup>-2</sup>
'Belcoln F1'	128	11.99 <sup>†</sup>
'Predi F1'	75	7.03
'Csa'vo'zott F1'	89	8.36
Local	100	9.35

<sup>†</sup> LSD 5%=2.908.

Generally, mean yield of pepper plants without plastic cover increased compared to those grown under plastic tunnel. While the early yield means of all hybrids tended to be higher than the local cultivar, after the removal of plastic cover the mean yield of the local cultivar remained second and showed 11-25% increase in yield compared to 'Csa'vo'zott F1' or 'Predi F1', respectively. However, this difference was not statistically significant.

The 'Belcoln F1' with the production of 12 kg in 2.5 m<sup>-2</sup> showed 28% increase in yield compared to local cultivar. The mean yields of all the cultivars in the total of 21 harvests are presented in Table 3. 'Belcoln' F1 had 25-40% higher production compared to local and 'Predi' F1 cultivars (P<0.05).

The results for vitamin C contents of the pepper cultivars are shown in Table 4. The vitamin C content of the local cultivar was 26% and 46% greater than 'Predi F1' and 'Csa'vo'zott F1', cultivars respectively (P<0.01).

Table 3. Total mean yield of four pepper cultivars in 21 harvests.

Cultivars	Relative percentage	kg 2.5 m <sup>-2</sup>
'Belcoln F1'	125	16.06 <sup>†</sup>
'Predi F1'	85	10.93
'Csa'vo'zott F1'	102	13.10
Local	100	12.85

<sup>†</sup> LSD 5% = 4.228.

Table 4. Vitamin C contents of four pepper cultivars.

Cultivars	Relative percentage	mg 100 <sup>-1</sup> g
'Belcoln F1'	96	77.875 <sup>†</sup>
'Predi F1'	74	60.225
'Csa'vo'zott F1'	54	44.025
Local	100	81.325

<sup>†</sup> LSD 1% = 22.1

In recent years, production of vegetable crops including peppers, under plastic tunnels has been promoted in Guilan province. This practice allows possibility of premature and out-of-season production of this crop as it is reported by other investigators (6, 9, 12).

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