

# Evaluation of Pepper Cultivars for Production in Northern Great Plains



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## Introduction

Pepper (*Capsicum annuum*) is an annual warm-season crop requiring 50-75 days of growing for first fruit harvest. The best growing season for pepper in the northern great plain region is May-August. As a good source of vitamin C, vitamin B6 carotenoids, flavonoids and other antioxidants, pepper is one of the highly nutritious vegetables readily available at the farmer's market. Due to the short-growing season in the northern great plains, the amount of fruit harvested per plant is limited especially for bell peppers. This study was carried out to evaluate and screen pepper cultivars for earliness and fruit yield in the northern climate.

## Objectives

1. Evaluate the performance of commercial pepper cultivars for local production in the northern great plain region.
2. Compare the yield and fruit quality of selected cultivars of pepper for farmer's market sales.

## Materials and Methods

Ten commercial cultivars (Ace F1, California Wonder, Carmen F1, Jupiter, King Arthur F1, King Crimson F1, King of the North, Peacework, Ruby King, Yankee Bell) of sweet pepper were evaluated for their performance and fruit quality for local production in North Dakota.

Seeds were germinated in cell packs containing Pro-Mix root substrate and seedlings at 6 true-leaf stage were transplanted into the field on 6 June, 2014, about 2 weeks later than the normal planting time. Plants were spaced 1.5 feet (45 cm) apart in rows that were spaced 4 feet apart. Plants were grown in heavy clay soil and overhead irrigated as needed.

Mature fruits with full pigmentation were harvested weekly from 13 September for four times as shown in Fig 1. The number and weight of total fruits harvested and percent fruits marketable were determined at each harvest time. Similarly, fruit dimensions were measured for each cultivars. Fruit quality characteristics (sweetness, texture, flavor, color/appearance) were measured using 1-5 scale where 1 is low and 5 is high for each quality attribute; this rating was done by sampling and quality check from 20 volunteer individuals.

LSD mean separation was calculated at 95% confidence level in yield and quality data to check if each cultivars were significantly different.



Fig. 1. Mature fruits of 10 pepper cultivars grown in the NDSU campus vegetable plot in Fargo, ND.

## Results

### 1. Pepper yield and performance:

Fruits harvested after three month of transplanting were shown in Fig.2. The number of fruits harvested for 2 months from 10 plants is shown in Table 1. Overall, the average fruit yield was highest in fourth harvest among four consecutive harvest. While Ace F1 (1.3 kg/10 plants) had the highest fruit yield during the first week of harvest, King of the North had the highest yield during 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> harvest and total average yield (11.9 kg/10 plants). However, cultivar Peacework had highest marketable fruit ratio (Fig. 3). Only, cultivar King of North and Yankee were statistically different in terms of total fruit yield (Table 1).



Fig. 2. Pictures showing 10 mature peppers cultivars.

Table 1. Yield of fruits harvested each week and the total yield of fruit.

Cultivar	Yield of fruits (kg)				Total fruit yield (kg)
	1 <sup>st</sup> harvest	2 <sup>nd</sup> harvest	3 <sup>rd</sup> harvest	4 <sup>th</sup> harvest	
Ace F1	1.35±0.19a	0.64±0.14ab	0.83±0.32ab	7.96±0.93a	10.78±1.08ab
California Wonder	0.62±0.23bc	1.21 ±0.29a	0.74 ± 0.24ab	7.25±1.19a	9.83±0.84ab
Carmen F1	1.11 ± 0.07ab	0.89±0.23ab	0.92 ± 0.33ab	7.42±0.61a	10.35±1.04ab
Jupiter	0.27±0.18c	0.83 ±0.35ab	1.53±0.48a	8.47±1.04a	11.11±1.01ab
King Arthur F1	0.89± 0.51abc	0.83 ± 0.23ab	1.08±0.46ab	7.16±0.72a	9.97±1.18ab
King Crimson F1	1.21± 0.18ab	0.83 ± 0.21ab	0.53±0.13ab	6.88±0.65a	9.45±1.02ab
King of the North	0.64±0.35bc	1.25 ± 0.2a	1.19±0.51ab	8.67±2.04a	11.94±2.12a
Peacework	0.95±0.16ab	0.70 ± 0.12ab	0.85 ±0.26ab	6.80±0.57a	9.31±0.83ab
Ruby King	1.05±0.49ab	0.89 ± 0.24ab	0.78±0.34ab	7.91±1.17a	10.65±1.82ab
Yankee Bell	1.12 ±0.29ab	0.54 ± 0.07b	0.43±0.10b	6.05±0.85a	8.14±0.77b
LSD <sub>0.05</sub>	0.67	0.63	1.03	3.13	3.79

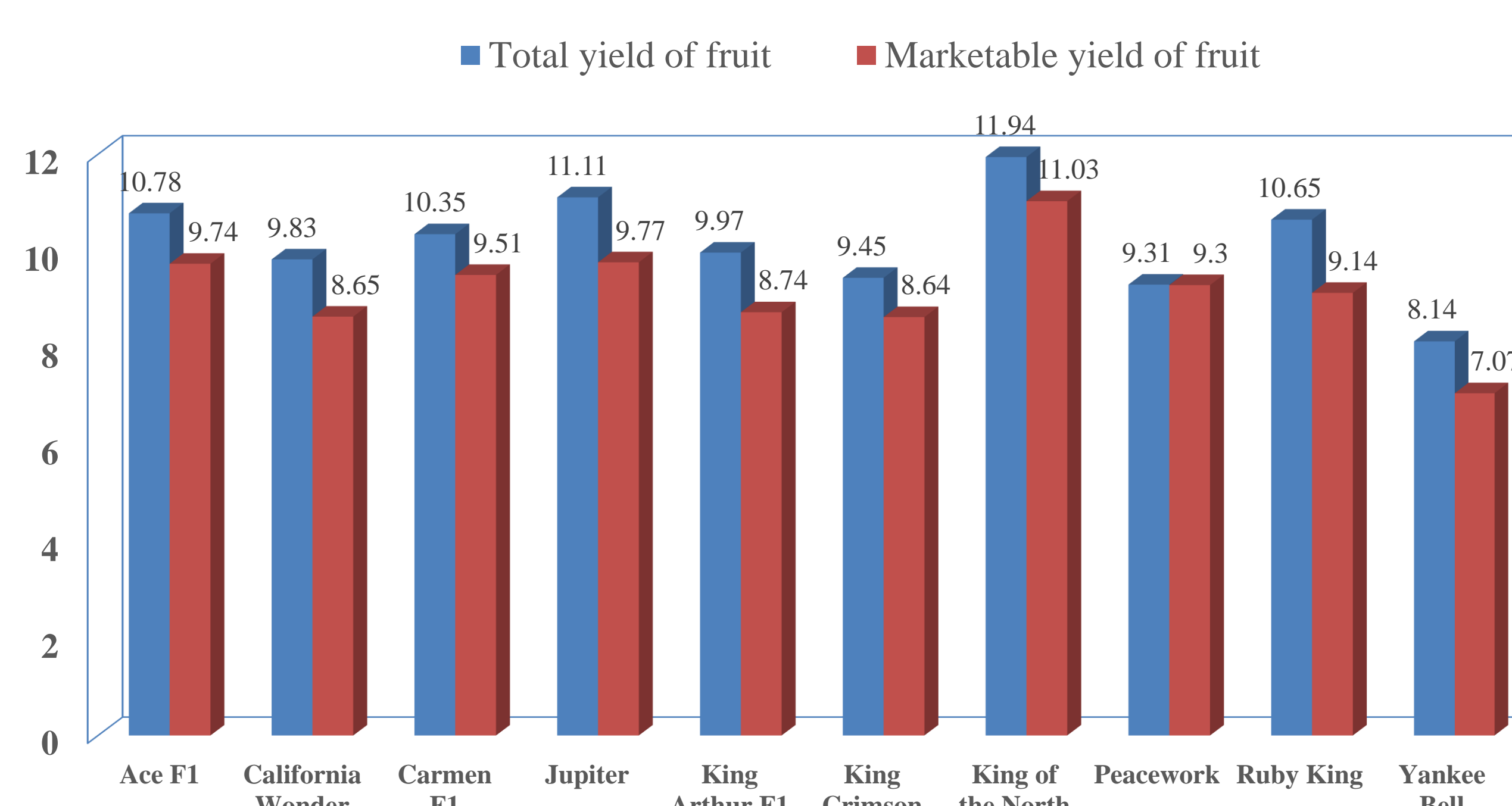


Fig. 3. Comparison of total and marketable fruit yields of 10 pepper cultivars.

### 2. Pepper quality characteristics:

Fruit qualities measured by sweetness, texture, flavor and color/appearance were also evaluated for each cultivar and we found that that cultivar California Wonder had good sweetness, Carmen F1 had good texture and flavor and King of North had good appearance among all cultivar (Table 2). Total soluble sugar content measured using refractometer were presented in Fig. 4; which showed that cultivar Ruby King had highest sugar content of 8.78% Brix reading compared to other cultivars which showed an average of 8.3%.

Table 2. Comparison of sweetness, texture, flavor and appearance of pepper cultivars fruits.

Cultivar	Sweetness	Texture	Flavor	Color/appearance
Ace F1	3.00±0.45bcd	3.83±0.40a	3.83±0.17ab	4.17±0.40bcd
California Wonder	3.83±0.31a	3.67±0.42a	4.00±0.37ab	3.50±0.34d
Carmen F1	3.50±0.43ab	4.00±0.26a	4.17±0.31a	4.83±0.17ab
Jupiter	3.17 ± 0.31abc	3.83±0.31a	3.33±0.33ab	3.67±0.42d
King Arthur F1	3.33 ± 0.42abc	3.67±0.33a	3.17±0.31b	3.67±0.3d
King Crimson F1	3.00 ± 0.26bcd	3.50±0.34a	3.33±0.21ab	4.17±0.31bcd
King of the North	2.83 ± 0.40bcd	3.83±0.17a	3.17±0.31b	5.00±0.01a
Peacework	2.33± 0.33d	3.83±0.17a	3.33±0.49ab	4.50±0.22abc
Ruby King	3.00 ± 0.37bcd	3.67±0.21a	3.17±0.31b	3.67±0.49d
Yankee Bell	2.67 ± 0.21cd	3.67±0.21a	3.33±0.33ab	3.83±0.31cd
LSD <sub>0.05</sub>	0.83	0.81	0.90	0.81

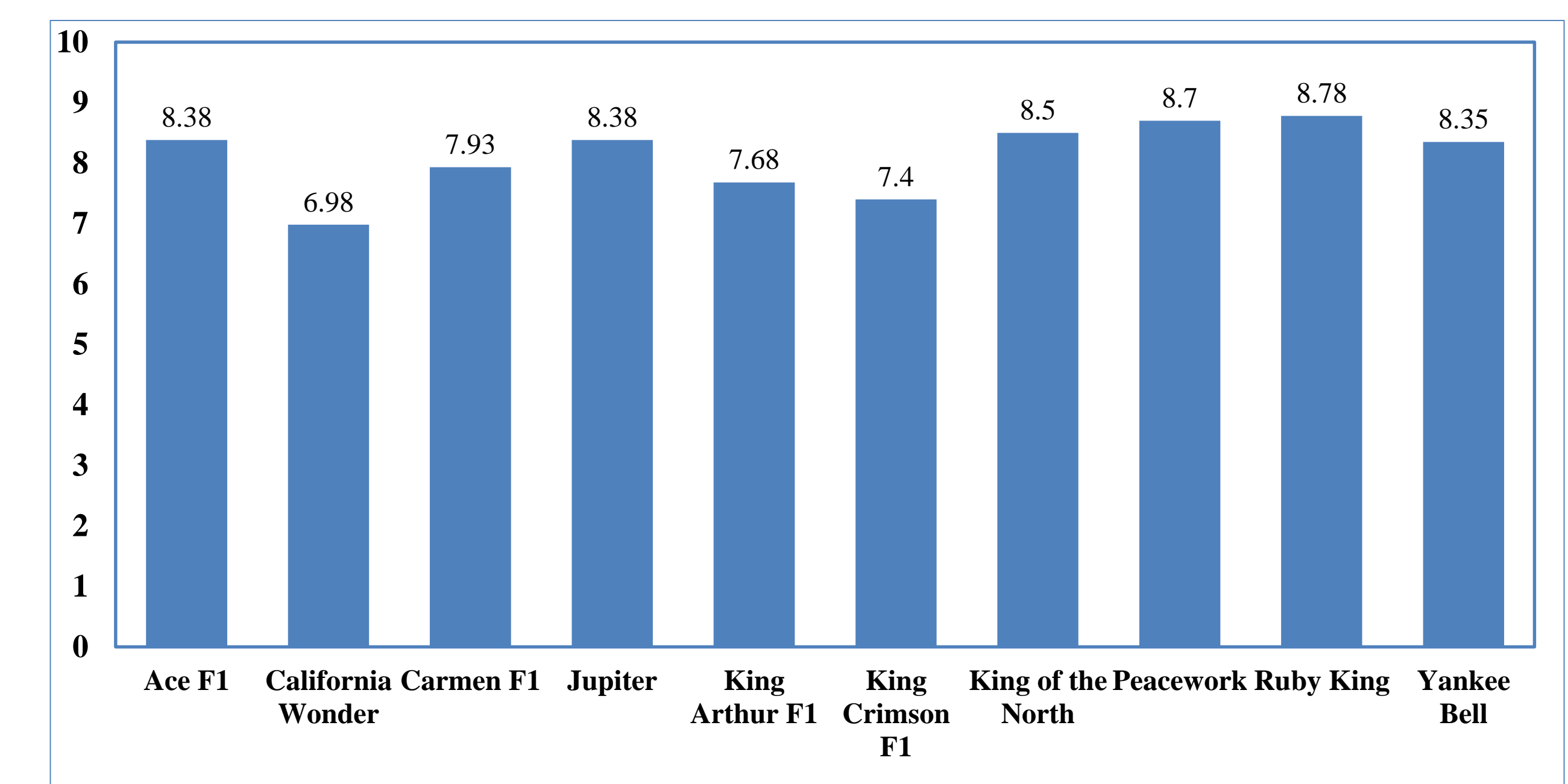


Fig. 4. Soluble sugar contents of fruits of 10 cultivars measured by refractometer.

## Conclusion

While all of the ten peppers showed good horticultural traits with decent yield, King of North provided the highest fruit yield with higher ratio of marketable fruits. Statistical analysis showed that only few cultivars with higher or lower performance range were significantly different but most of cultivars with average performance were similar (Tables 1,2). Since, no single cultivar outperformed the rest in all quality categories, the growers in this region can select and use any cultivar with specific traits of their interest. It is note worthy that sweet taste measured upon harvesting did not match with the sweetness or higher sugar content detected after storage for 2 days at room temperature. For example, fruits of Carmen F1 was sweetest (with 11% sugar content) at the time of harvest did not maintain the same level of sweetness when determined after storage at room temperature for one or two days.

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