

## Effects of cultivars and plant spacing on performance agronomics and muskmelon yield

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### Abstract

Lara is one of the states with the highest production of melon in Venezuela, therefore it is very important to evaluate the behavior of cultivars with adaptations possibilities in the area, with the aim of selecting those with the highest productive potential. Hybrids melons were cultivated in Bobare, Lara state: Araucano, "Caballo de hierro", hybrid 642 and Packstar, sowed at 40 and 60 cm between plants, determining 35 and 50 days after the emergency (DPE): longitude of main and secondary buds, number of branches.plant<sup>-1</sup>, number of fruits/plant and yield. Cultivars and distances of sow were combined in a plot arrangement of 8 treatments with 3 replications in randomized blocks. The distance and cultivars affected the longitude of the main sprout 35 DPE, observing a higher development in plants of the "Araucano" hybrid (128.58 cm) separated 60 cm, and secondary sprouts for the hybrid (134.71 cm), but in plants divided at 40 cm. 50 DPE, the highest development of the main sprout (181.71 cm) and secondary (195.63 cm) was observed at the "Araucano" hybrid sowed at 60 cm, corroborating the beneficial effect that might have a higher space on increments in the development of the plant. The cultivar and the sow distance did not affect the number of branches.plant<sup>-1</sup>. It was reported a lower number of fruits 35 DPE for the hybrid "Caballo de hierro" in plants separated at 60 cm (2.5 fruits.plant<sup>-1</sup>). During the harvest, the highest yield with 36750 kg.ha<sup>-1</sup> was reported for the Packstar cultivar at 40 cm, all cultivars showed the highest yield in plants at 40 cm, ratifying the theory that affirms that hybrids, in relation to varieties, are less likely to reduce the yield at the time that reduce the sow distances.

**Key words:** melon, cultivars, sow distance and yield

## Introduction

Melon (*Cucumis melo* L.) is a very important fruit in Venezuela, since it has a high demand in the national and international market, being this aspect an incentive to expand this product. The country has reached a production of 191,810 TM, distributed in 9.933 has with an average yield of 19.310 kg.ha<sup>-1</sup> (13), becoming Lara in one of the highest producer states with 10.400 TM (12), which potential originates from its high area with a semiarid weather.

There are few researches done in the country concerning the agronomical aspects of melon, even though it is well known that it is possible to influence the production, controlling and improving some handling factors that affect the development of the plant (8). In this matter, the seed's quality and the selection of the cultivar to be employed in the sow has a great influence on the production (22), therefore, at the moment of selecting the vegetal material it is necessary to consider its productive potential and the quality properties of fruits that are being produced, since melon cultivars have a differential behavior regarding the development, ripening of the fruit and mainly, regarding some parameters that define the quality (11), once considered

these, the factors must be adjusted to the exigencies of the market. On the other hand, the effect of the population of plants on yield have been widely studied, and has even been a theme for mathematic models (4), however, these models can not predict with accuracy which is the best population or separation between plants for any production systems of crops, but many prior experiences reveal that the density of plants per area unit is a very important factor and is responsible of and adequate development of plants (20) and affect the productivity of melon cultivars (1, 9), when the other factors are supplied correctly.

All what have been mentioned create the necessity of doing constant introductions to varieties and hybrids of melon, to evaluate the behavior and productive potential of plants with adaptation possibilities to weather conditions of Bobare, Lara, area that is characterized by its high temperatures and sunstroke, and natural fertile land.

The objective of this research was to evaluate the behavior of some vegetative variables and the yield of four melon hybrids, as well to evaluate the effect that the separation has between plants on these variables.

## Materials and methods

The essay was carried out at the "Matatere" faro, located in Bobare, Irribarren municipality, Lara state, Venezuela. Geographically, the farm is located at 10° 23' north latitude and

69° 32' west longitude and at 550 m.s.n.m. The soil has a clayey loamy texture of high natural fertile lands (table 1), con a slope lower to 1%.

The area corresponds to a very

**Table 1. Soil analysis at the moment of the essay at 0 – 20 cm.**

Sand	Loam	Clay	MO	P	K	Ca	Mg	S	Zn	Mn	Cu	B	pH	CE
%														
(mg. kg)														
(1:2) (CEx10)														
23	37	40	1.7	104 <sup>MA</sup>	396 <sup>MA</sup>	4310 <sup>A</sup>	380 <sup>M</sup>	37 <sup>MA</sup>	20.4 <sup>MA</sup>	63 <sup>MA</sup>	6.1 <sup>MA</sup>	1.9 <sup>A</sup>	85	26.2

MA: too high; A: high; M: médium, B:low; MB: too low  
Source: Megalab, 2003

dry tropical forest (bms-t) according to the Holdrige classification (3). The average mean precipitation for 2002 was of 550 mm, with a regimen of bimodal distribution. The first peak of maximum precipitation occurred in April, and the second in October. The annual mean temperature was 26°C. The average relative humidity was 69% with an evaporation of 2.600 mm.year<sup>-1</sup>, approximately 8 hours of sunstroke and dry winds (Rodríguez and Pire, 2004).

In a surface of 30 m<sup>2</sup>, plants of hybrid melon were sowed: "Araucano", "Caballo de hierro", hybrid 642 and Packstar, all the materials of the reticulated fruits and widely adapted to the conditions of Lara. Plants were handled under traditional handling conditions, that is, sowed in ridges, with 2 m of separation and 0.50 m between double rows, and 40 or 60 cm between plants (depending the treatment), for a total of 6 plants.m<sup>-2</sup> and 4 plants.m<sup>-2</sup> respectively, and densities of 25.000 and 16.667 plants.ha<sup>-1</sup> respectively.

Irrigation was employed per gravity in furrows, incorporating 10 g of urea + 30 g of organic fertilizer per plant, in base of chicken excretion and rice peels (fertipollo) after the sow, and weekly fertilizations with a complete chemical formula 12-24-12 at a reason of 30 g.plant<sup>-1</sup>, superficially and next to the plant during the development of the crop. The control of weeds, pest and illnesses was done according to the incidence, employing techniques and procedures usually employed by producers.

The essay was carried out as

randomized plots, under a plot arrangement of 4 x 2 (four cultivars, 2 sow distances) with 3 replications, where each experimental unit was constituted by 4 plants selected at random. Evaluations were done 35 and 50 days after the emergency of the plant (DPE) to quantify the following variables:

·Longitude of buds or guides: the main branch and secondary branches were measured with a flexible meter, in four plants taken at random, per treatment and per plot that were previously market.

·Number of branches.plant<sup>-1</sup>: consisted on quantifying the number of branches per plant, once

determined the longitude of the sprout.

·Number of fruits.plant<sup>-1</sup>: the total number of fruits per plant per plot was counted for each treatment.

·Yield: the total yield for each cultivar was estimated, based in the fresh weight and numbers of harvested fruits, the results are expressed in kg.ha<sup>-1</sup>.

In order to evaluate the different variables related to the development and yield of plants, the statistical software SAS was used (19). The central tendency of results was expressed by the mean of values and spacing through a standard deviation of the mean.

## Results and discussion

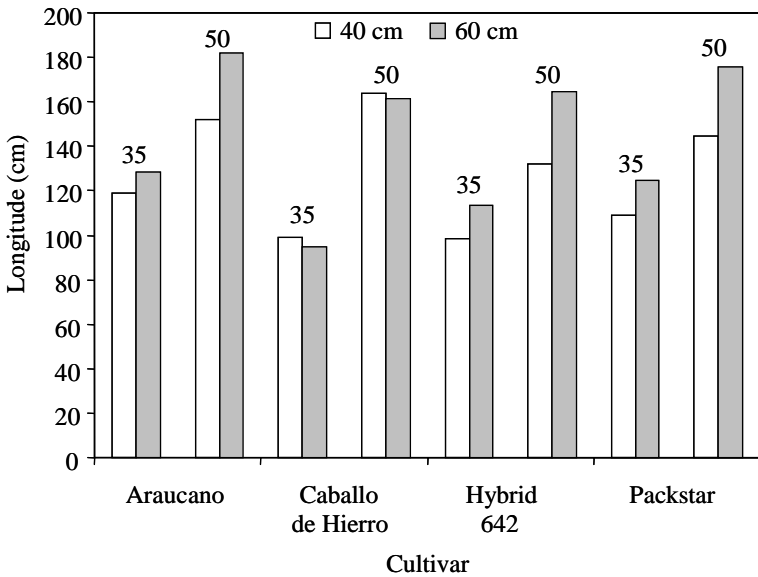
### Longitude of the bud or main guide and secondary buds

It was observed that after 35 days at 50 DPE, the highest growth of buds or main guides with 128.52 and 181.91 cm respectively, correspond to the "Araucano" hybrid (figure 1) sowed at 60 cm of separation between plants, and it was found that these results are over those reported by Singh and Chhonkar (20) for the Jaunpury cultivar, sowed at a same distance between plants. This behavior repeats in the secondary buds corresponding to the same hybrid with same separation between plants (figure 2). The results obtained in relation to variables, agree to the increment in the development of guides compare to the increment in the sow distance between plants, reported by Maynard and Scott (9).

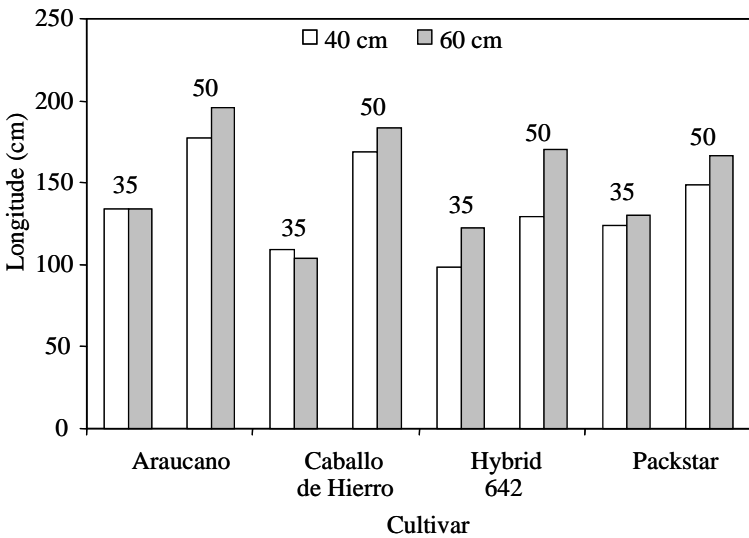
This effect might be related to a reduction in the competence between plants (2) and therefore an increment in the availability of water and nutrients (7) that is translated in a higher vegetative development.

### Number of branches per plant

The cultivar and the sow distance between plants did not have an effect on the number of branches per plant, however, the highest development was observed in the Araucano cultivar, with 5.87 branches.plants<sup>-1</sup> 50 DPE, in plants sowed at 40 cm (table 2). Comparing the results obtained in this research with those reported by Jiménez and Valverde (5), who obtained approximately 4.94 guides.plant<sup>-1</sup> as an average of three cultivars ("Cantaloupe SJ 45", Cantaloupe 21")



**Figure 1.** Effect of the cultivar and sow distance between plants on the longitude of the main bud in melon plants, two periods after the emergency.



**Figure 2.** Effect of the cultivar and the sow distance between plants on the longitude of secondary buds in melon plants, two periods after the emergency.

**Table 2. Effect of the cultivar and sow distance between plants on the longitude of the main bud, secondary bud, number of branches and number of fruits in plants of four melon hybrids, two periods after the emergency.**

Cultivar	DPE (dias)	Longitude of bud or main guide (cm)		Longitude of buds or secondary guides (cm)		Number of branches		Number of frutos	
		40	60	40	60	40	60	40	60
Araucano	35	119.08 <sup>Ab</sup>	128.54 <sup>Aa</sup>	134.17 <sup>Aa</sup>	133.67 <sup>Aa</sup>	4.83 <sup>Aa</sup>	4.50 <sup>Aa</sup>	4.75 <sup>Aa</sup>	5.67 <sup>Aa</sup>
	50	152.0 <sup>Ab</sup>	181.71 <sup>Aa</sup>	177.0 <sup>Ab</sup>	195.63 <sup>Aa</sup>	6.87 <sup>Aa</sup>	5.08 <sup>Aa</sup>	1.25 <sup>Aa</sup>	1.25 <sup>Aa</sup>
Caballo de hierro	35	98.92 <sup>Ba</sup>	94.67 <sup>Ba</sup>	108.88 <sup>Ba</sup>	103.63 <sup>Ba</sup>	4.33 <sup>Aa</sup>	4.25 <sup>Aa</sup>	3.5 <sup>Aa</sup>	2.5 <sup>Ba</sup>
	50	163.92 <sup>Aa</sup>	161.08 <sup>Aa</sup>	168.67 <sup>Abb</sup>	183.33 <sup>Aa</sup>	5.8 <sup>Aa</sup>	5.18 <sup>Aa</sup>	0.92 <sup>Aa</sup>	1.33 <sup>Aa</sup>
Híbrido 642	35	98.25 <sup>Bb</sup>	113.67 <sup>Aa</sup>	98.29 <sup>Bb</sup>	122.67 <sup>Aa</sup>	4.08 <sup>Aa</sup>	4.08 <sup>Aa</sup>	4.5 <sup>Aa</sup>	4.67 <sup>Aa</sup>
	50	132.25 <sup>Ab</sup>	164.37 <sup>Aa</sup>	129.61 <sup>Cd</sup>	170.60 <sup>Aa</sup>	5.25 <sup>Aa</sup>	5.25 <sup>Aa</sup>	1.42 <sup>Aa</sup>	1.83 <sup>Aa</sup>
Packstar	35	109.08 <sup>Abb</sup>	124.42 <sup>Aa</sup>	124.04 <sup>Ab</sup>	129.67 <sup>Aa</sup>	4.25 <sup>Aa</sup>	4.42 <sup>Aa</sup>	3.42 <sup>Aa</sup>	5.83 <sup>Aa</sup>
	50	144.35 <sup>Ab</sup>	175.42 <sup>Aa</sup>	148.71 <sup>Bcd</sup>	166.71 <sup>Aa</sup>	5.17 <sup>Aa</sup>	5.25 <sup>Aa</sup>	1.50 <sup>Aa</sup>	1.50 <sup>Aa</sup>

Means with different letters differ significantly ( $P < 0.05$ ) according to Duncan mean test. Capital letters correspond to the cultivar effect, small letters mean sow distance. The information represents the mean of 3 replications.  
SBP: Separation between plants.

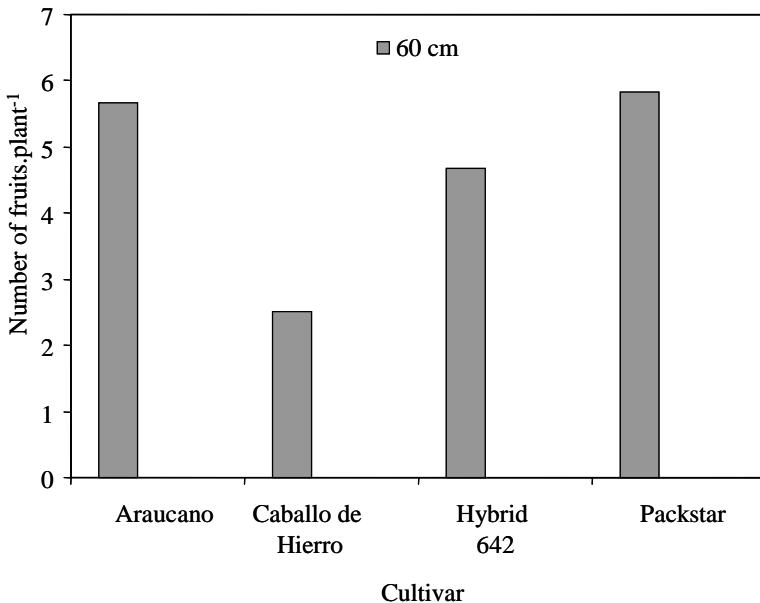
and Improved Tam Dew) at the end of the vegetative cycle, it is observed that this value is under of the values reported in this research, in plants at 50 DPE and sowed in both distances, likely, are over 3.8 and 3.7 branches.plants<sup>-1</sup> reported by Kultur *et al.*, (7) for genotypes Birdmest 1 and Birdmest 2, submitted at distances of 70 and 35 cm between plants, respectively.

#### Number of fruits per plant

The lowest number of fruits (2.5 fruits.plants<sup>-1</sup>) 35 DPE was observed in the hybrid "Caballo de hierro" in plants separated at 60 cm (figure 3). On this matter, Knavel (6) says that the number of fruits is a varietales condition, which is generally

correlated to variations in the density of plants per hectare.

On the other hand, 50 DPE was observed a higher number of fruits.plants<sup>-1</sup> in the hybrid 642, in plants sowed at a distance of 60 cm, even though significant differences were not detected. These results agree to those reported by Lazin and Simmons (8), Maynard and Scott (9), and Kultur *et al.* (7), who mention an increment in the number of fruits in relation to an increment in the sow distance between plants, mainly related to a lower competence, however, Mendlinger (10) and Nerson (15) report that with increments in the density of plants, more fruits are produced but with lower size.



**Figure 3.** Effect of the cultivar and the sow distance between plants on the number of four hybrids of melon fruits, 35 after the emergency.

### Yield

At the moment of the harvest, the highest yield with  $36.750 \text{ kg}\cdot\text{ha}^{-1}$  was reported for the hybrid Packstar, sowed at 40 cm of separation between plants (figure 4), showing this hybrid a great productive potential over the one reported by Rodríguez and Rire (18) in plants of the same hybrid, sowed at 30 cm and in similar environmental conditions and handling. The statistical differences observed by this experience among the hybrids in relation to yield corroborate the criteria reported Lazin and Simmons (8), Pulgar *et al.*, (17) and Soto *et al.*, (21) who indicate that the yield obtained on each crop is a varietals condition.

Excepting the hybrid "Caballo de hierro", which yields are similar in both spacing, it was observed a significant reduction of yield in plants separated at 60 cm, which might be related to a high production of total biomasa that might affect negatively the yield. The results of this research agree to prior researches in plants sowed at similar distances (6, 7, 16 and 20), where researches concluded that the highest yield per hectare in plants at the lowest separation, may be related to a development of more plants per area unit, besides Mozo (14), says that hybrids in relation to varieties, are less likely to reduce the yield at the time the distances of sow reduce.

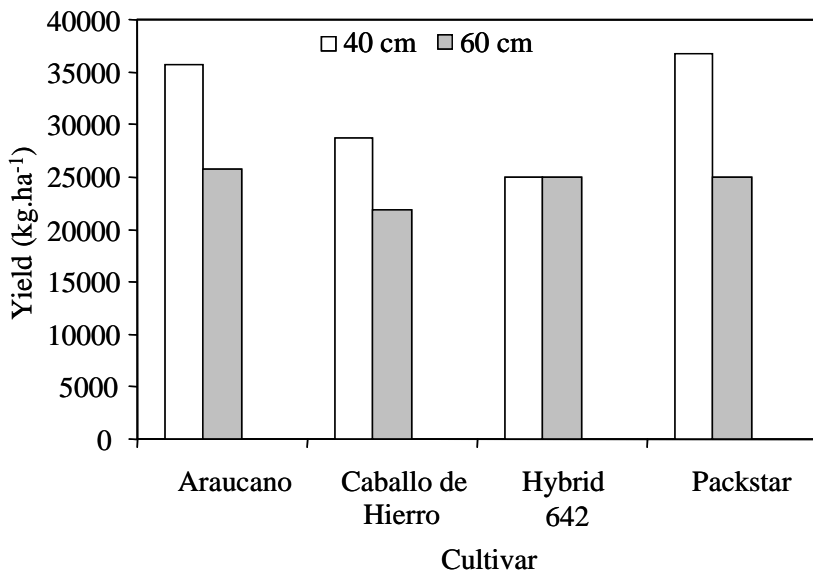


Figure 4. Effect of the cultivar and the sow distance between plants on the yield of four melon hybrids at the moment of the sow.

## Conclusions

Two periods after the emergency, the highest development of the main and secondary guides was obtained for the hybrid "Araucano", in plants separated at 60 cm. It was also noticeable that there was not an effect of hybrid factors or on the separation of plants in relation to the number of branches.plants<sup>-1</sup>, in any of the periods after the emergency.

The lower number of fruits 35 days after the emergency was obtained in the hybrid "Caballo de

hierro" with 2.5 fruits.plant<sup>-1</sup> at 60 cm of separation between plants; 50 days after the emergency there was not an effect of hybrids factor or of separation between plants on the number of fruits.

The highest yield of plants at the moment of the harvest was obtained for the hybrid "Packstar" with 36.759 kg.ha<sup>-1</sup> in plants sowed at 40 cm, these results allow corroborating that hybrids are less likely to reduce yields with reductions in the sow distances.

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