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# Influence of cattle manure levels on the snap bean cultivars grown in sandy soil condition

**Shafeek M.R., A. M. Shaheen, Magda M. Hafez, Asmaa R. Mahmoud and Aisha H. Ali**

*Vegetable Res. Dept., National Research Centre, Dokki, Giza, Egypt.*

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## ABSTRACT

Two field experiments were carried out in the experimental station of National Research Centre at Nubaria, Behira Governorate, Egypt during the two seasons of 2014/2015 and 2015/2016 to study the effect of different rates of cattle manure (6, 12 and 18 $m^3$/fed.) on snap bean cultivars (Bronco or Paulista) and their interaction on improved plant growth, total pods yield and its components as well as nutritional pods values. The obtained results showed that: 1-The highest fertilization rate of cattle manure (18 $m^3$ /fed.) gave the tallest plant, the highest number of leaves per plant and the biggest fresh and dry weight of leaves and stems as well as the highest total pods yield /fed. Also, the obtained results reported that the pod measurements expressed as (pod length, pod diameter, average pod weight) as well as pod nutritional values such as (N, P, K and protein) were increased with increasing cattle manure rates. 2- The best values of snap bean plant criteria such as (plant growth, total pods yield as well as the contents of N, P, K, protein) were obtained by Bronco cultivar followed by Paulista cultivar. 3-The favorable effects of the interaction between cattle manure levels and cultivars on the growth, total yield and pods parameters were obtained when Bronco cultivar of snap bean fertilized with 18 $m^3$ /fed.

***Key words:*** Snap bean, Bronco or Paulista, growth, pods yield, pod nutritional values

## Introduction

Snap bean (*Phaseolus vulgaris* L.) is one of the substantial legume vegetable crops cultured in the dried area for jointly green pods and dry seeds, suppose as a perfect provenance of protein.

Animal manure have utilized as provenance on regional fertilizer in the considerable improves polity towards the globe until much century's. Convenient utilize of organic manure is fundamental for together an output and ecological viewpoint. Stratify proportion so as to be furthermore depressed ability leads to nutritive shortage and depressed produce. On the other aspect, likewise highest level mastery driving to nitrate nominate, phosphorus escape, quickened eutrophication of great lake, while extravagant development of vegetables. Consequently, comprehension how much succeed manure is substantial for any cultivation practicability and cattle that depend on organic manure as a master provenance on nutritional values, as well as possible for crop farmers whoever have arrival to economic equipping on organic manure or other organic nutritive provenance.

Utilize of chemical fertilizers has reject consequent to the power squeeze, who have extremely influenced greater of the promoting polities Hauck (1982). Nutrients guaranty in organic manures are progressive further tardily and are stockpiled for an extended timing in the ground include long-term superfluity effects, increased root expansion and great crop output Sharma and Mittra (1991) and AbouEl-Magd *et al* (2006). Manures are commonly exercised at great levels, proportional to chemical fertilizers. At what time utilized at great levels, they grant lagging effects on development and output of manage vegetables Makinde and Ayoole (2008). Amelioration of environmental situation and the requirement to decrease expense of fertilizing produce are cause for enthusiastic utilize of organic manures Bayu *et al* (2006). Organic manures improve soil fertility by stimulating soil microbial biomass Ayuso *et al* (1996). Enforcement of manures tolerates implant system through superior nutrient recycling El-Shakweer *et al* (1998). Manures supply a provenance of whole indispensable macro- and micro nutrients in ready-made various forms, just like that ameliorative the physical and biological properties of the soil AbouEl-Magd *et al* (2006). However, it is remarkable that

**Corresponding Author:** Shafeek, M.R.,Vegetable Res. Dept., National Research Centre, Dokki, Giza, Egypt.
E-mail: shafeek52000@yahoo.com

implementation of organic manures however generated the biggest and prospective vegetable output, unless furthermore increased the soil fecundity and enrichment Sanwal *et al* (2007). Though organic manures include plant nutrients in short amounts as emulate to the fertilizers, its growth elevating ingredients such as enzymes and hormones, aside from plant nutrients make them advantageous for amelioration of soil fertility and outputs. However, Luna Zendejas, *et al* (2011) reported that (*Phaseolus vulgaris* L.) grown with the enforcement of animal manure registered the highest growth compared to control. Similar results establish by Mahmoud *et al* (2013) found that the vegetative growth characters of pea plant were significantly increased by raising the rates of organic manure usage in sandy soil. In the same respect, Aisha *et al* (2014) suggested that adding organic manure at high rates (20 $m^3$/fed.) had a significant effect on growth parameters, i.e. plant length, number of leaves/plant, fresh and dry weight/plant as well as root fresh and dry weight and its components (root length and diameter). Also, grant the highest proportion of protein, N, P, K and Fe ppm as well as total carbohydrate % of turnip plants. Furthermore, Shafeek *et al* (2015) showed that the supplement of organic manure at higher rates (3.2 ton/fed.) increased plant growth, fruit yield, physical and chemical characters of fruit quality of cantaloupe plants.

In opinion of the exceedingly different cropping systems under which snap bean is grown, mercantile yields are very changeable and predominating pulsation for beneath the genetic possibility of the species Graham and Ranelli (1997). Hundreds of varieties of snap bean are now available for the greenhouses and open field. They are organizing exceedingly in size, shape, color, flavor, disease resistance and season of maturity. However, many previous workers indicated that varieties of snap bean plants play a great role for improving the growth and productivity Rembialkowska *et al* (2005) and Zaki *et al* (2012). However, Dahmardeh *et al* (2010) reported that Aljazaeri of bean cultivar transcend all other cultivars in terms of biological and economical yields. As such, the cultivars had a significant effect on economical and biological yields. Thus, the development of forgiving cultivar becomes an efficient and economical production strategy.

## Material and Methods

The present work was carried out during two successive winter seasons of 2015 and 2016 at the Experimental Station of National Research Centre in Nubaria region, North Egypt to study the effect of three rates of cattle manure on the growth, yield and pods quality of two snap bean varieties (Bronco or Paulista).The physical and chemical properties of the soil are presented in Table (1).

**Table 1:** Physical and chemical properties of the experimental soil.

| Physical properties | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sand | | Clay | Silt | Texture | F.C. % | W.P. % | |
| 90.08 | | 9.26 | 0.66 | Sandy | 16.57 | 5.25 | |
| Chemical analysis | | | | | | | |
| E.c. M/m | pH | Meq/ L | | | | | |
| | | Ca | Mg | Na | K | Hco3 | Cl |
| 1.7 | 8.2 | 7.02 | 0.527 | 0.982 | 0.31 | 1.3 | 0.566 |

*Treatments were as follows:*

1- Cattle manure at (6 $m^3$/fed.).
2- Cattle manure at (12 $m^3$/fed.).
3- Cattle manure at (18 $m^3$/fed.).

NPK fertilizer i.e. ammonium sulphate (20.6%N), calcium super phosphate (16% $P_2O_5$) and potassium sulphate (48% $K_2O$) were added at rates of 150, 100 and 50 kg/fed. respectively. The phosphorus fertilizer was added during soil preparation and before seed sowing. The nitrogen and potassium fertilizers were divided into two equal parts and the first addition added during the soil preparation but the second added 35 days after seed sowing. Seeds were sown on the second week of September in both seasons. Treatments were arranged in a complete randomized block design with three replicates. Seeds of snap bean cv. Bronco or Paulista were obtained from Horticultural Research Institute, Agriculture Research Center, Egypt. The design of the experiments were split plot with three replicates, the rates of cattle manures were arranged in the main plots but snap bean cultivars were

distributed within the sub plots. The area of experimental plot was 10.5 $m^2$. Every plot consisted of 5 dripper lines 3m in length and 0.7m in width. Seeds were sown in hills 20 cm apart on one side of dripper lines and two seeds per hill. The normal agriculture practices of snap bean under drip irrigation system were followed according to the recommendations of Agriculture Ministry.
The chemical analysis of organic manure used in this study is shown in Table (2).

**Table 2:** Chemical composition of the applied cattle manures;

| Organic manure | pH | EC | Percentages | | | | ppm | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | N | P | K | Fe | Mn | Zn | Cu |
| Cattle | 7.5 | 14.1 | 7.9 | 0.32 | 0.41 | 0.85 | 650 | 135 | 105 | 11 |

*Data recorded:*

*Growth Characters:*

A random sample of five plants was taken from every plot at 60 days after sowing in both seasons of study for measuring the growth characters of snap bean plants expressed as follows: Plant height, number of leaves, fresh and dry weight g/ plant of leaves and stems.

*Total yield and its components:*

At harvesting stage (60 days from seeds sowing for both seasons), 15 of snap bean plants from each treatment were randomly taken to study the yield and its components including: pod (length, diameter and average weight) and total yield (tons/fed.) as well as number of pods/$m^2$.

*Pod nutritional values:*

Fresh pods of snap bean were dried in oven at (70°C) to constant weight and dried sample was taken for chemical analysis. The chemical constituents of snap bean pods were determined as the percentage of N, P and K according to the methods of Pregl (1945), Troug and Mayer (1939) and Brown and Lilleland (1946) respectively. In addition, the protein percentages in pods tissues of bean were calculated by multiplying nitrogen content by 6.25 according to the method described in the AOAC (2000).

*Statistical Analysis:*

The obtained data of experiments were subjected to the statistically analysis of variance procedure and means were compared using the LSD method at 5% level of significance according to Gomez and Gomez (1984).

**Results and Discussion**

**Vegetative growth characters:**

*Effect of cattle manure levels:*

Data in Table (3) showed obviously that mounting the level of cattle manure from (6 to 18 $m^3$/fed.) significantly increased all vegetative growth parameters of snap bean plants expressed as ( plant length, number of leaves per plant as well as fresh and dry weight of leaves and stems) when cattle manure level increased from 6 to 18 $m^3$/fed. It could be concluded that, the higher level of cattle manure had a favorable effect on bean plant growth. The notability in the vegetative growth by the higher level of organic manure might be refer to its convenient effect on the physical prepared of the soil Marculescu *et al* (2002) and Ozores Hampton *et al* (2011) or due to the slow emission of nutrients Eissa (1996). Moreover, animal manure guaranty higher levels of comparatively obtainable nutritional elements, especially N, which is basically, desired for plant growth Amanullah *et al* (2007). Many studies have attempted to estimate the prominence of organic manures in vegetables product. Senjobi

*et al* (2010) found that the employ of organic manures increased all the growth characters of the green vegetable. Different studies have found advantageous effects of organic manure on soil characters expressed as magnitude intensity Fawole *et al* (2010), soil humidity content Adeleve *et al* (2010), water-holding capability and other soil physical properties Fawole *et al* (2010). The acquired results are in pretty endorsement with Jahan *et al* (2008), Dada and Fayinminnu (201.0) and Abul-Soud *et al* (2010).

**Table 3:** Effect of level of cattle manure fertilizer on growth of snap bean plants during 2015 and 2016 seasons.

| Levels of cattle manure ($m^3$/fed.) | Cultivars | Plant length (cm) | No. leaves/plant | F. W. leaves (g) | F. W. stem (g) | D.W. leaves (g) | D. W. stem (g) |
|---|---|---|---|---|---|---|---|
| **2015 season** | | | | | | | |
| 18 | Bronco | 52.167 | 15.000 | 49.833 | 24.307 | 19.013 | 8.150 |
| | Paulista | 43.000 | 14.000 | 39.530 | 18.157 | 15.563 | 6.233 |
| Mean | | 47.58 | 14.500 | 44.682 | 21.232 | 17.288 | 7.192 |
| 12 | Bronco | 44.833 | 14.000 | 40.487 | 21.197 | 14.947 | 7.203 |
| | Paulista | 37.167 | 9.667 | 29.870 | 17.017 | 11.260 | 3.873 |
| Mean | | 41.00 | 11.833 | 35.178 | 19.107 | 13.103 | 5.538 |
| 6 | Bronco | 41.333 | 12.667 | 34.510 | 15.033 | 11.920 | 4.437 |
| | Paulista | 32.633 | 7.667 | 26.743 | 13.963 | 9.963 | 2.950 |
| Mean | | 36.98 | 10.167 | 30.627 | 14.498 | 10.942 | 3.693 |
| Average | Bronco | 46.111 | 13.889 | 41.610 | 20.179 | 15.293 | 6.597 |
| | Paulista | 37.600 | 10.444 | 32.048 | 16.379 | 12.262 | 4.352 |
| LSD at 5% level | cultivars | 2.28 | 1.762 | 4.092 | 1.090 | 2.080 | 1.694 |
| | levels | 1.62 | 1.676 | 4.669 | 2.634 | 1.900 | 0.795 |
| | Interaction | ns | ns | ns | ns | ns | ns |
| **2016 season** | | | | | | | |
| 18 | Bronco | 51.100 | 15.333 | 50.337 | 23.590 | 16.900 | 6.513 |
| | Paulista | 43.267 | 12.667 | 39.287 | 18.293 | 13.753 | 4.883 |
| Mean | | 47.18 | 14.000 | 44.812 | 20.942 | 15.327 | 5.698 |
| 12 | Bronco | 45.000 | 14.000 | 40.887 | 20.230 | 14.220 | 4.490 |
| | Paulista | 38.033 | 10.000 | 34.093 | 14.317 | 10.233 | 3.697 |
| Mean | | 41.52 | 12.000 | 37.490 | 17.273 | 12.227 | 4.093 |
| 6 | Bronco | 42.433 | 12.667 | 34.800 | 15.363 | 11.390 | 3.067 |
| | Paulista | 33.720 | 9.000 | 30.477 | 11.260 | 9.163 | 2.347 |
| Mean | | 38.08 | 10.833 | 32.638 | 13.312 | 10.277 | 2.707 |
| Average | Bronco | 46.178 | 14.000 | 42.008 | 19.728 | 14.170 | 4.690 |
| | Paulista | 38.340 | 10.556 | 34.619 | 14.623 | 11.050 | 3.642 |
| LSD at 5% level | cultivars | 2.04 | 1.017 | 2.978 | 1.412 | 1.240 | 0.359 |
| | levels | 1.03 | 1.903 | 1.672 | 1.742 | 0.835 | 0.519 |
| | Interaction | ns | ns | ns | ns | ns | ns |

*2- Effect of bean cultivars:*

Data in Table (3) showed obviously that Bronco cultivar of snap bean improved vegetative growth parameters (Plant height, number of leaves, fresh and dry weight g/ plant of leaves and stems) than *Paulista* cultivar in both seasons 2015 and 2016. However, the statistical analysis of the gained information reported that the distinction within the various cultivars treatments were considerable sufficient to reach that significant grade of 5%. Comparable consequence were found by Luna Zendejas, *et al* (2011) on bean plants as they reported that considerable seeds variety's might be due to the higher vegetative growth, higher photosynthesis and metabolic efficiency. The spotted differences in vegetative growth of cultivars are fundamentally due to the genotype of every cultivar. This consequence was in harmony with preceding returns of (Molina *et al* (2001), Farag and Helal (2004), AbdAllah (2008) and Nosser (2011).

*3-Effect of the interaction between cattle manures levels and cultivars:*

The highest vegetative growth such as (plant length, number of leaves, fresh and dry weight) of snap bean plants were acquired by adding high rates of cattle manure (18 m3/fed.) of Bronco cultivar.

The depress values were registered when fertilizer by cattle manure at (6 m3/fed.) with bean cultivar (Table 3). The statistical analysis of the gained information did not enough to reach the 5% levels. The obtained data in both two seasons were comparable.

**Total pods yield and its quality:**

*1- Effect of cattle manure:*

Data offered in Table (4) reported that total yield of snap bean plant such as number of fruits/$m^2$, total yield (ton/fed.), pod length, diameter (cm) and average pod weight (g) were significantly improved by increasing level of cattle manure from 6 to 18 $m^3$/fed. The increase in the total pods yield and pod parameters may be due to convenient effect of cattle manure on the vegetative growth. In addition, enough also the higher proportion of N, P and K uptake by snap bean plants by received a higher level of cattle manure (18 $m^3$/fed.). And its participate in mounting the organic soil carbon content and raising soil output, meantime an increase in performance of the advantageous microorganisms in the soil El-Gizy (1994), Suresh *et al* (2004) and Remesh (2008). Transform organic nutrient's various forms to mineral forms, which befit available to plants as the slow-release fertilizers Kolbe *et al* (1995) and Marschner (1995). Also, cattle manure plays a remarkable role in increasing soil physical properties Wani and Lee (1995). Some examiner came to comparable results of snap bean plants Gabr (2000), El-Bassiony *et al* (2010) and Kikas and Libek (2005).

**Table 4:** Effect of level of cattle manure fertilizer on total yield and its components of snap bean plants during 2015 and 2016 seasons.

| Levels of cattle manure ($m^3$/fed.) | Cultivars | Total yield (ton/fed.) | No. of pods/$m^2$ | Pod | | |
|---|---|---|---|---|---|---|
| | | | | Length (cm) | Diameter (cm) | Weight (g) |
| **2015 season** | | | | | | |
| 18 | Bronco | 3.253 | 73.000 | 14.000 | 1.633 | 8.790 |
| | Paulista | 2.533 | 64.333 | 12.333 | 0.750 | 6.333 |
| Mean | | 2.893 | 68.667 | 13.167 | 1.192 | 7.562 |
| 12 | Bronco | 2.873 | 65.333 | 12.167 | 1.500 | 7.750 |
| | Paulista | 2.317 | 48.667 | 10.500 | 0.700 | 4.333 |
| Mean | | 2.595 | 57.000 | 11.333 | 1.100 | 6.042 |
| 6 | Bronco | 2.133 | 61.000 | 10.667 | 1.133 | 5.650 |
| | Paulista | 2.100 | 36.667 | 9.000 | 0.633 | 2.567 |
| Mean | | 2.117 | 48.833 | 9.833 | 0.883 | 4.108 |
| Average | Bronco | 2.753 | 66.444 | 12.278 | 1.422 | 7.397 |
| | Paulista | 2.317 | 49.889 | 10.611 | 0.694 | 4.411 |
| LSD at 5% level | Cultivars | 0.354 | 7.546 | 0.963 | 0.065 | 0.901 |
| | levels | 0.293 | 8.561 | 0.577 | 0.118 | 0.512 |
| | Interaction | ns | ns | ns | ns | ns |
| **2016 season** | | | | | | |
| 18 | Bronco | 3.033 | 74.000 | 15.033 | 1.567 | 7.733 |
| | Paulista | 2.200 | 64.667 | 12.780 | 0.833 | 6.203 |
| Mean | | 2.617 | 69.333 | 13.907 | 1.200 | 6.968 |
| 12 | Bronco | 2.567 | 66.000 | 12.490 | 1.333 | 5.800 |
| | Paulista | 1.867 | 55.000 | 11.070 | 0.700 | 4.770 |
| Mean | | 2.217 | 60.500 | 11.780 | 1.017 | 5.285 |
| 6 | Bronco | 2.000 | 62.333 | 11.393 | 1.173 | 4.663 |
| | Paulista | 1.600 | 40.000 | 8.933 | 0.600 | 2.703 |
| Mean | | 1.800 | 51.167 | 10.163 | 0.887 | 3.683 |
| Average | Bronco | 2.533 | 67.444 | 12.972 | 1.358 | 6.066 |
| | Paulista | 1.889 | 53.222 | 10.928 | 0.711 | 4.559 |
| LSD at 5% level | Cultivars | 0.042 | 2.492 | 1.444 | 0.095 | 0.526 |
| | Levels | 0.130 | 3.471 | 0.566 | 0.191 | 0.306 |
| | Interaction | ns | ns | ns | ns | ns |

*2- Effect of bean cultivars:*

It is apparent that Bronco cultivar of snap bean give rise to significant improved in pods (length, diameter and weight) and number of pods/$m^2$ as well as total yield (tons/fed.) in rapprochement to bean cultivar during seasons 2015 and 2016 (Table, 4). The direction of these results was confirming by Berglund (2007) reported that high quality production of yield rely on the mineral sufficient nutrition, weather expression and varieties. Select cultivar preference is of the most substantial single operator for organic strawberry production as nominate the erroneous cultivar inevitably leads to problems Shafeek *et al* (2003).

*3-Effect of the interaction between cattle manures levels and cultivars:*

The interaction effect between cattle manure levels and cultivars of snap bean on total yield and its components registered no significant divergence on total fruit yield and pods physical characters as shown in Table (4). Commonly, it could be pronounced that fertilizing by high level of cattle manure (18 $m^3$/fed.) by Bronco cultivar gave the highest but not significant values of total pods yield and pods physical quality of snap bean.

**Pods nutritional values:**

*1- Effect of cattle manure:*

The significant effect spotted on increasing percentage of N, P, K and protein contents of snap bean pods with various rates of cattle manure fertilizer during 2015 and 2016 seasons as shown in Table (5). High rate of cattle manure fertilizer (18 $m^3$/fed.) reported the highest percentage of N, P, K and protein contents as followed by other levels of cattle manure. Similar conclusion were reported by El-Sherbeny *et al* (2012) found that the increasing levels of organic manure up to (40 $m^3$/ fed.) fulfill in the highest amounts of crude protein, N, P and K in Japanese radish. Mahmoud and Ibrahim (2012) reported that append organic manure increased carbohydrate content of turnip roots in clay loamy soil. Heba *et al* (2014) reported that organic matter and nutrients available (N, P and K) were increased as the level of the organic materials increased in the soil. In pea pods, Mahmoud *et al* (2013) found that the chemical ingredients (N, P, K and total protein) significantly increased by increasing the level of organic manure up to 180 kg N/fed in sandy soil. Also, Murphy (2014) showed that organic manure as a soil drench alone or with yeast increased the N % and P % uptake rates, the values were 126%, 174% for N and 255%, 322% for P, respectively. In turnip plant, Aisha *et al* (2014) recorded that the adding organic manure at high rates (20 $m^3$/fed) gave the highest percentage of protein, N, P and K percentage. These results may be due to the capacity of soil organic matter to influence a range of functional soil physical, chemical and biological properties and to play an important role in nutrient cycling Murphy (2014)**.**

*2- Effect of bean cultivars:*

The resulted data of Table (5) revealed that cultivars of snap bean had significant effect on increasing the percentage of N, P, K and protein in pods of snap bean in both seasons 2015 and 2016. Bronco cultivar recorded the best percentage of N, P, K and protein in pods of snap bean *compared to Paulista* cultivar. This result might be due to chemical analysis is affected by genotypes. Dahmardeh *et al* (2010) reported that Aljazaeri of bean cultivar surpassed all other cultivars in terms of biological and economical yields.

*3-Effect of the interaction between cattle manures levels and cultivars:*

The interaction effectiveness between cattle manure rates and snap bean cultivars had no significant divergence on the proportion of nitrogen, protein, P and K contents of pods tissues as shown in Table (5). It is of advantage to note that fertilizer by higher rates of cattle manure (18 $m^3$/fed.) on Bronco

cultivar grant preferable consequence of pods nutritional values. On the contrary, bean cultivar fertilizer by (6 $m^3$/fed.) generated least nutritional values of snap bean pods.

**Table 5:** Effect of level of cattle manure fertilizer on pod nutritional values of snap bean plants during 2015 and 2016 seasons.

| Levels of cattle manure ($m^3$/fed.) | Cultivars | % | | | | % | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | N | Protein | P | K | N | Protein | P | K |
| | | **2015 season** | | | | **2016 season** | | | |
| 18 | Bronco | 3.200 | 20.000 | 0.600 | 2.667 | 3.233 | 20.210 | 0.790 | 2.910 |
| | Paulista | 2.723 | 17.023 | 0.483 | 2.583 | 2.670 | 16.687 | 0.543 | 2.750 |
| Mean | | 2.962 | 18.512 | 0.542 | 2.625 | 2.952 | 18.448 | 0.667 | 2.830 |
| 12 | Bronco | 2.720 | 17.003 | 0.473 | 2.350 | 2.350 | 14.687 | 0.713 | 2.373 |
| | Paulista | 2.083 | 13.023 | 0.333 | 2.317 | 2.030 | 12.690 | 0.443 | 2.283 |
| Mean | | 2.402 | 15.013 | 0.403 | 2.333 | 2.190 | 13.688 | 0.578 | 2.328 |
| 6 | Bronco | 2.093 | 13.120 | 0.290 | 2.243 | 2.047 | 12.793 | 0.260 | 2.157 |
| | Paulista | 1.690 | 10.563 | 0.193 | 2.113 | 1.697 | 10.610 | 0.250 | 2.097 |
| Mean | | 1.892 | 11.842 | 0.242 | 2.178 | 1.872 | 11.702 | 0.255 | 2.127 |
| Average | Bronco | 2.671 | 16.708 | 0.454 | 2.000 | 2.543 | 15.897 | 0.588 | 2.480 |
| | Paulista | 2.166 | 13.537 | 0.337 | 2.338 | 2.132 | 13.329 | 0.412 | 2.377 |
| LSD at 5% level | Cultivars | 0.249 | 1.581 | 0.080 | 0.149 | 0.254 | 1.588 | 0.091 | 0.129 |
| | Levels | 0.134 | 0.836 | 0.041 | 0.026 | 0.257 | 1.607 | 0.053 | 0.047 |
| | Interaction | ns | ns | ns | ns | ns | ns | ns | ns |

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