

Studies in Brazil of Agricultural Experimentation using the Cultivar Catalonha (Cichorium Intybus L.)

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Abstract: *Catalonha production, one of the varieties of chicory, contends it is rich in vitamins and minerals and your study is based on the fact that it is little studied in Brazil, with the exception of the State of São Paulo in Brazil. This work aimed to raise bibliographically works with one of the cultivars of chicory, in Brazil and Catalonha encourage new studies in the country. The methodology consisted in the study of published works about the grow in agricultural experimentation Catalonha. We conducted a bibliographic survey of works made with the cultivar for performance assessment, growth and productivity. The results obtained can be concluded that cultivating Catalonha presents greater height, number of leaves and greater productivity in relation the other cultivars of chicory. But has less fresh and dry mass, lower rate of nitrate reduction and quality of taste considered infer.*

Keywords: *Experimental studies, Performance, Productivity.*

I. Introduction

The vegetables are herbaceous consistency, plants usually short cycle and intensive cultural practices, whose edible parts are directly used in food. Provide leaves, stems, flowers, fruits, roots and other parts that are used in food. Complement the basic power, because they are important sources of vitamins, minerals and fiber, plus present medicinal value. Thus, the production and use of greenery are important as an alternative for producers, both the supply of nutrients, and the ease of adaptation to this practice of cultivation (AMARO et al., 2007).

Recent estimates show that the brazilian harvest of vegetables exceeds 19 million tons, considering 32 species cultivated, and moves more than 24 million reais (EMBRAPA, 2015).

The chicory (*Cichorium intybus* L.) belongs to the family Asteraceae and constitutes, with the lettuce, chicory, cabbage, Endive and cabbage-leaf, leafy vegetables group most popular (CORRADI et al., 2005).

The *Cichorium intybus* L. is very similar to the chicory who differs by having more elongated leaves, narrower, covered with fur and with bitter taste more pronounced (Filgueira, 2000). Camargo (1992) described as the most cultivated varieties: Large, white Sheet and Sugarloaf.

Trani & Steps (1998) also include a cultivar of toothed leaf called Catalonha among the most cultivated. Second H Cultivars Leaf Drop, sugar loaf and Catalonha are the most cultivated in the region of Campinas.

According to the Institute of agricultural economics and the coordination of technical assistance, published by Caldwell and Camargo (1999), the production, productivity and the acreage of 'Catalonha' are presented separately from those of chicory. According to these authors, the cultivated areas with chicory and 'Catalonha', in the State of São Paulo, for the year 1998, there were respectively, 960 and 546 hectares.

Although the nutritional point of view the chicory is higher than the lettuce (Khathounian, 2001) because it is more calories and more protein content, starch, fiber, calcium, iron and vitamin A, is one of the fruits and vegetables less studied in Brazil regarding the behavior of most cultivars sold. Not found, for the Brazilian conditions, research paper for the chicory in the 90. The only research works for chicory, newer, were those of Matsumoto & Minami (1986) and Haag Minami (1988) & who studied in the field of behavior grow Wide Sheet about spacing and mineral nutrition, respectively. No known studies on the possibility of cultivation of this vegetable under protected cultivation.

However, producers of vegetables under protected cultivation, due to unsatisfactory prices obtained with peppers, cucumber and tomatoes, have sought alternatives with a preference to the shorter cycle leaf vegetables such as Endive, lettuce, chicory, among others (new et al., 2003).

In addition, crop rotation is important auxiliary system in controlling some pests and diseases which focus on Solanaceae and Cucurbits. If you have information not in the region of Campinas on the performance of the cultivated chicory under agricultural greenhouse in late winter and early spring (new et al., 2003).

The Chicory has economic importance and have great potential for trade growth as the population know their nutritional and pharmacological properties. The fresh consumption allows the conservation of their nutritional properties, and its leaves high in fiber, calcium, potassium, phosphorus and iron, vitamins A, B1, B2,

B5 and C, and amino acids (Luengo et al., 2000). How nutraceutical plant, name given to plants with nutritional and medicinal use possibilities (Gonzales-Lima et al., 1986), your consumption is recommended for kidney problems, liver and urinary infections, because their active ingredients increase bile secretion, stimulate the secretion of gastric juices and increase appetite (SGARBIERI, 1987).

However, as with any vegetable hardwood, it must also concern itself with the nitrate content in the leaves of chicory, because, according to Schröder & Bero (2001), 50% of the increase of nitrate in human organism is caused by eating vegetables.

The main concern of the use of nitrites and nitrates in foodstuffs is a result of toxicity for excess in the diet and the formation of n-nitroso compound endogenous as N-nitrosodimetilamina and monometilnitrosamina, which have effects, teratogenic and mutagenic carcinogens (MALIK; MIDIAN, 2000).

Among the environmental factors that Act on the nitrate content in the leaves, the luminous intensity and the temperature, which vary according to the region, the time of cultivation and harvest time.

The luminous intensity is among the most important factors with regard to nitrate buildup, acting on the activity of nitrate reductase, which has maximum your activity under intense luminosity (WRIGHT & DAVISON, 1964; BEEVERS & HAGEMAN, 1969; MAYNARD & BARKER, 1972; MAYNARD et al., 1976; BLOM-ZANDSTRA & LAMPE, 1985; GRAIFENBERG et al., 1990).

Mystery man (1979) stated that temperatures of 25 to 35° C cause decrease in the activity of the enzyme nitrate reductase, and the intensity of your inhibition increases with increasing temperature of 35 to 45° c.

Despite the isolated effect of environmental factors or interactions of these on the content of nitrate in leafy vegetables should be considered also the genetic variability to the potential for nitrate accumulation. Small but consistent genetic differences have been found between species, subspecies and cultivars as the tendency to nitrate buildup (MAYNARD & BARKER, 1972).

Finally, this article aims to raise bibliographically works with one of the cultivars of Chicory, in Brazil and Catalonha encourage new studies in the country.

II. Material and Methods

The methodology consisted in the study of published works about the grow in agricultural experimentation Catalonha. We conducted a bibliographic survey of works made with the cultivar for performance assessment, growth and productivity.

III. Results and Discussion

In 2005, was held by Corradi et al., at UNESP-Campus of Jaboticabal, an experiment involving the culture of chicory. The treatments were composed by cultivating (Sugarloaf, leaf Drop and Catalonha) and spacing between plants (10, 15, 20, 25 cm), under experimental design of randomized blocks, in 3 x 4 factorial scheme, with three repetitions. The spacing between lines of planting was 0.10 m. prior to installation of the experiment in the field, the liming and fertilization of planting according to the results of the chemical analysis of the soil and based on the recommendation of Trani et al. (1997), for chicory. Direct seeding was performed in flower beds, and trimming of plants when these were 3 cm tall, to adjust the spacing between plants.

Cultivating Catalonha was presented the largest height of plants (37.81 cm), and this trait is not influenced by the spacing, and a greater number of leaves (38.25), also not influenced by spacing. To cultivate sugar loaf was presented the biggest fresh pasta (6.82 kg m²), and the Broad-leaved varieties (4.50 kg m²) and Catalonha (4.76 kg m²) did not differ significantly from each other. The spacing of 10 cm presented best result of fresh pasta (7.31 kg m²). Significant difference was not observed to dry mass in relation to plant varieties, and 10:15 cm spacings shown best results dry mass (0.47 and 0.38 kg m² respectively) (CORRADI et al., 2005).

In 2001, Cavarianni et al., conducted an experiment in hydroponics in Jaboticabal (SP), whose goal was to evaluate the difference between chicory and cultivars between harvest schedules in relation to nitrate accumulation in the leaves. Four cultivars were evaluated (Sugarloaf, Trieste, Wide Sheet early and Catalonha) and two times of harvest (5 and 17 hours).

There has been interaction of the factors assessed, and all cultivars showed higher nitrate levels when harvested at 17 hours. The results in lower nitrate levels that were observed in the absence of luminosity are consistent with those observed in the bibliographies (Wright & Davison, 1964; Beevers & Hageman, 1969; Maynard & Barker, 1972; Maynard et al., 1976; Blom-Zandstra & Lampe, 1985; Amit et al., 1990; Pommerening et al., 1992a, b; Graifenberg et al., 1993), in which the authors point the light intensity as one of the factors prosecutors reducing nitrate accumulation by plants.

Among the cultivars, presented the lowest rate catalonha of nitrate reduction (13%), and may be related to the fact that present main rib highlighted and narrow leaf limb. According to Wright & Davison (1964), on petioles, the nitrate levels are much higher than those observed in foliar limbo. The possible explanation for this

fact is that these structures are characterized by being carriers and distributors of substances and compounds, such as nitrate.

For cultivation in hydroponic systems and management conditions, we recommend the use of Wide Leaf and early cultivars of Trieste, accumulate less nitrate, regardless of the time of harvest, offering lower risk to human health (CAVARIANNI et al., 2001).

Santos et al. (2013) evaluated the agronomic performance of chicory cultivars in Campinas-SP. The cultivars were the \rightarrow Catalonha evaluates, the Yellow Leaf, the leaf and the Pão de Açúcar, in experiment carried out on construction sites in the Central Experimental Center of the agronomic Institute in December 2009 to January 2010 with transplanted seedlings. The delineation experimental field was completely randomized design, with four replicates. To 50 days after the transplant were assessed five plants of each installment about the height, number of leaves, fresh and dry, and in two of these plants the leaf area. Was evaluated, too, the taste, with and without seasoning, for six tasters.

The cultivars showed significant differences in relation to the height of the plants, leaf area and taste. Through the data obtained for fresh and dry matter mass, in magnitude to cultivate sugar Bread presented the biggest production of fresh pasta, being about 79.3% higher than 'Catalonha', which showed the smallest value. You can see that the growing Yellow Sheet presented in magnitude, greater productivity (48.5 t/ha) than the cultivars Catalonha (32.2 t/ha) and Broadleaved (37.7 t/ha). The estimation of the thickness of the sheet through the inverse of specific leaf area, whereas € dry weight as an expression of the foliar volume (Benincasa, 1988) showed, in magnitude, the following values in cm: 0.0462 for Yellow sheet', 'Drop' Sheet for 0.0220, 0.0211 for 'Sugar Loaf' and for '0.0153 Catalonha'. Cultivating Catalonha has greater height, which is also the Group of cul tivares \rightarrow greater leaf area, although characterized by producing plants with narrow leaves, long and with serrated edges (SANTOS et al., 2013).

With respect to, evaluated with and without seasoning, it was found that 'Broad-leaved' presented the best flavor (2.86), no differ from Yellow sheet' (1.96), but differed statistically from 'Sugar Loaf' (1.82) and 'talonha' \rightarrow Ca (Note 1.42) that did not differ among themselves. The four chicory cultivars evaluated did not have significant differences with regard to productivity, but differed as to the flavor, being 'Broad-leaved' set to good quality and Catalonha as of Wed € lower quality (SANTOS et al., 2013).

In 2003, New et al. evaluated the performance of Broad-Leaf cultivars, and Catalonha, under glass with plastic sheeting in experiment, from July to September 2001, at the core of Campinas from IAC. The experiment was wrapped in random blocks with sub-divided plots for time, having three repetitions. To 50, 57, 64 and 71 days after sowing were evaluated ten plants of each sub-plot regarding the time, average number of leaves, fresh and dry matter biomass and leaf area. These opportunities were also evaluated the production of sheets in a linear meter of construction site.

There was no difference among the cultivars as the average number of leaves per plant, but there was interaction between cultivars and time of evaluation for leaf area, fresh and dry biomass and leaf production. Cultivating Catalonha was presented the greater height and improved productivity, Although the biomass fresh and dry matter have been higher in cultivating Sugar Loaf, which also showed the highest leaf area. It was noted also that although it was done to maintain the same number of plants per line, the Broad-leaved and Catalonha cultivars developed only vertically. However, chicory spoon is not recommended after the 64 (days after sowing) since 'Catalonha' and the 'Broad Leaf' showed reduced leaf area to 71. Also, in this sampling was found to show initial attack of mildew which could cheapen the product quality (new et al., 2003).

It was concluded that it was feasible to produce chicory under protected cultivation constituting another alternative to this production system (new et al., 2003).

IV. Conclusion

Cultivating Catalonha presents greater height, number of leaves and greater productivity in relation the other cultivars of chicory.

Has less fresh and dry mass, lower rate of nitrate reduction and quality of taste considered lower.

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