

## ASPECTS REGARDING PYRETHRUM PLANT BIOLOGY IN ITS SECOND YEAR OF VEGETATION

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**Abstract.** *Pyrethrum (Chrysanthemum cinerariaefolium) is a perennial plant from which natural insecticides, the pyrethrins, are derived. Pyrethrum seedlings were planted in 2010, at a row distance of 70 cm with 3 different plant densities: 40000 plants/ha, 50000 plants/ha, 60000 plants/ha. Biology aspects of the mentioned plants in their second year of vegetation at Jucu, 2011 show a vegetation onset at the beginning of March, bud formation in the middle of April and full flowering in the middle of June. The height of the bushes was comprised between 45.17 cm and 52.72 cm, and the diameter between 40.73 cm and 48.28 cm. Most of the shoots in this experiment had between 1 and 3 branches ending with a bud. Flowering lasted until the second decade of July, when seeds were already formed. A second flowering occurs, if flowers are harvested. Planting pyrethrum at a density of 50000 plants/ha, leads to the formation of the largest bushes (in diameter) and the highest number of buds per plant, exceeding the other two distances tried. Nevertheless, the 60000 plants/ha density induces the formation of a greater number of seed.*

**Keywords.** Pyrethrum, biology, bush, bud development, flowering.

### INTRODUCTION

Pyrethrum (*Chrysanthemum cinerariaefolium*), regarded as a section of the genus *Chrysanthemum*, family Asteraceae is a perennial temperate plant with small white, daisy-like flowers from which natural insecticides, the pyrethrins, are derived (Bisht *et al.*, 2009). It is cultivated on highlands of tropical and subtropical regions of the world or in lowland regions with temperate climates without frost, but with cool night temperatures which induce blooming (Li *et al.*, 2011).

Though known as a crop plant for almost a century, the development features of the plant were scarcely studied. Păun *et al.* (1988) show that in the first year of culture, sprang plants are very weak, having a slow growth and forming a thick rosette of leaves, while in the second and the following years, the plants have a rapid rhythm of development.

Bush size and plant height are morphological traits important for the design and development of the appropriate harvesting equipment. Bush size shows a strong interaction with environmental factors such as temperature, soil type and moisture. Larger bushes usually yield more flowers (Grdiša *et al.*, 2009).

As Kenya's Pyrethrum Value Chain Analysis of 2010 indicates, for pyrethrum plants the peak harvest occurs during the second year of culture. Hence the importance of a study conducted at this age of the mentioned plant. The results hereinafter presented concern biology aspects regarding pyrethrum plants in their second year of vegetation, cropped on an experimental field at Jucu, Cluj County. The observations and measurements made in 2011, regarded the vegetation onset,

the diameter and height of the bush, buds formation, buds development, flowering and seeds formation.

### MATERIAL AND METHOD

The experimental field was founded in the spring of 2010. The plants were planted at a row distance of 70 cm with 3 different plant densities: 40000 plants/ha, 50000 plants/ha, 60000 plants/ha.

Plant height was measured as the length of the central flowering shoots from the ground to the level of the flowers following the method used by Bhat, (1995) quoted by Grdiša *et al.*, (2009).

The diameters of the bushes were estimated after measuring the distance between the remotest and the closest 2 points of the bush; the mean obtained was considered as diameter.

Measurements on the bush, as well as the number of shoots and buds per bush were recorded before flowering, when most of the buds were well developed and ready to open.

### RESULTS AND DISCUSSION

The onset of vegetation was recorded during the first decade of March. From this moment, it will take approximately 40 days for the first buds to appear.

As it is shown in Tab. 1, the height of the bushes was comprised between a minimum of 45.17 cm (at a 60000 plants/ha density) and a maximum of 52.72 cm (at a 40000 plants/ha density). These results do resemble the ones given by Greenhill, (2007) and by Grdiša *et al.*, (2009), but slightly excel the upper limit offered by the first author: 15 to 45 cm, while they incline towards the lower limit suggested by the last motioned: 30 to 100 cm high.

Pyrethrum plants sharing a 60000 plants/ha density were the ones to develop bushes with the smallest diameter, 40.73 cm, but this value is closely followed by the one corresponding to the 40000 plants/ha variant: 41 cm. The largest bushes were developed for a 50000 plants/ha density, with a diameter of 48.28 cm. As Grdiša *et al.*, (2009) indicate the shoots branch a few times before terminating into white, daisy-like flower heads. Most of the shoots in this experiment had between 1 and 3 branches and buds, respectively, some of them forming 5, 6 or even 7 branches with a bud at its end. Nevertheless the average number of branches and buds was similar for all three variants: 2 buds/shoot.

**Table 1**

**Features of pyrethrum bushes dependent on plant density**

Density (plants/ha)	Bush height (cm)	Bush diameter (cm)	Average No. of shoots/bush	Average No. of buds/bush	Average No. of buds/shoot
60000	45.17	40.73	91	193	2
50000	45.53	48.28	125	271	2
40000	52.73	41.00	91	194	2

While bushes belonging to the 50000 plants/ha density had the highest number of shoots (125) and implicitly the highest number of buds (271), the other 2 variants presented resembling values to each other, both having an average of 91 shoots per bush; the 60000 plants/ha variant had 193 buds per bush and the 40000 plants/ha variant 194 buds per bush (Tab. 1).

The stage of buds appearance and their development spreads until the last decade of May, when the beginning of flowering is noticeable. The time span from vegetation onset to flowering was estimated at 70 to 85 days, this being similar to the data shown by Păun *et al.* in 1988, who indicated a 60 to 80 days period.

Harvesting maturity is considered to happen when  $\frac{1}{2}$  to  $\frac{3}{4}$  disc florets are open (Bhat, 1995 quoted by Grdiša *et al.*, 2009). This maturity was reached in the second decade of June, when this experiment is concerned, in the third decade of June in the experiment conducted at Ardennes, France (2004) and in the first decade of July in the experiment conducted in Champagne, France (2004) described by Magnier in 2008.

Flowering lasted until the second decade of July, when seeds were already formed and their pappus started to fall. Seed started to shake down during the last decade of August. An average of 216 seeds developed within the inflorescences developed at a 60000 plants/ha density, 173 seed corresponded to the 50000 plants/ha variant and 205 seeds to the 40000 plants/ha variant.

A second flowering occurs, if flowers are harvested. This begun in the first decade of September, and only for 6.97% of the plants sharing a 60000 plants/ha density, 18.18% of the plants sharing a 50000 plants/ha density and 17.65% of the plants sharing a 40000 plants/ha density.

## CONCLUSIONS

While the similarities between field data and data obtained through this experiment, regarding the height of the bushes, the branching and the flowering prove the fact that pyrethrum develops well in the environmental conditions of Jucu, the slight disparities that appear are a mark of the same conditions upon pyrethrum plants.

The very little data concerning plant biology and the lack of it where some aspects are concerned (the vegetation onset, bud formation and bud development, branching, bush diameter, seed formation and development, second flowering) are an argument for this experiment to happen and for future ones to take place and fathom development features of the two year old pyrethrum plants.

Planting pyrethrum at a 50000 plants/ha density, leads to the formation of the largest bushes (in diameter) and the highest number of buds per plant, exceeding the other two distances tried. Nevertheless, pyrethrum plants sharing a 60000 plants/ha density foster the formation of a greater number of seed.

The occurrence of the second flowering is noticeable, but the low percentage of plants that form flowers for the second time does not make it an important feature from the productivity point of view.

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