



## Effect of planting date and density on calendula and peppermint herbs

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### Abstract

A factorial experiment was conducted with a completely randomized design to evaluate the effects of planting date and density on calendula herbs and peppermint. It had 3 replicates and was done in Khosroshahr research farm, Tabriz in 2006. Under studied factors were: 3 planting dates (10 May, 25 May and 10 June) in 4 densities (25, 35, 45, 55) of the plant in square meters. The results of variance analysis showed that there was 1% probability significant difference between the effects of planting date and bush density on the leave number, bush height and the bush dry weight. But the mutual effect of the plant date in mentioned traits density was insignificant. Regarding the traits mean comparison, the total maximum dry weight was about the 55 bush density in mm. Also, the bush high density in mm causes the bush growth and its mass reduction. When there is the density grain, the flower number will increase due to bush grain in surface unit. Overall, we can conclude that 10 June planting and 45 bush density in mm is the most suitable items and results in favored production with high essence for these crops.

**Key words:** essence, herbs, planting date, density.

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## Introduction

In this century, the broad investigations about the herbs introduced new items to the physicians and pharmacologists and about a third of used drugs have natural and plant stem. Chemical and pharmaceutical industries are trying to build items related to the two third of the drugs by plant source instead of chemical ones (4). Hence, the pharmaceutical industry and research groups in many countries have focused their attention to the cultivation and production of medicinal plants. In this regard, every year, hundreds of hectares of arable land are allocated for the cultivation of medicinal plants in Europe and America (4). A brief review of the use of herbal medicines in the country reveals the precious heritage and identifies these plants used in traditional and rich medicine (3,4). Iran plateau in different areas have different climates and environments and this is why the abundance and distribution of species across the plains and into the mountainside are about 8,000 plant species and a significant portion of them contain valuable metabolic reserves. Hence the flora of Iran's right to be considered one of the world medicine places (4). Since a lot of herbs can be grown in a limited area, So not only plants, but also in the quality and quantity of ingredients will be readily available ingredients, they can be easily monitored (3,4). In this research effort is to investigate the effects of different planting density on growth and yield (fresh weight and dry weight) and calendula mint density best sowing date and get to the plants. To show the importance of medicine plants cultivation and production, it is enough to provide information in several important aspects: the variety type, the planting type and date and the amount of the crop production under planting, the economical importance, export importance, pharmacology needs, the effects of ecologic elements on the quality and quantity of effective materials (4 and 6). Annual consumption of medicinal plants in the industrialized countries of Europe between 1980 and 1985 increased from 7/5 to 8 percent (5). World statistics show that about 50 percent of the active ingredients in drugs sold worldwide are of plant origin and even in some countries; this percentage has risen to 90 percent (5). Although medicinal plants having the same active ingredients are combined together, but Botanical characteristics are not homogeneous. Comparing to horticulture, medicinal plants are less like vegetables and fruits, they are more like ornamental plants. They are various plants among them: one year, two years, and perennial, woody, shrubs and fruit trees (3). The issue of medicinal plants is ever changing, as a non-medicinal plant may introduces an important and valuable medicinal plant. In contrast, plant that had an important medicinal used in folk, may known a plant without that in scientific studies. Calendula as long as a cultivated ornamental plant until its medical properties were identified and used as a medicinal plant (4). Cultivation of the plant began in Europe in the 17th century. This plant flowers without sepals or petals of certain farms generally coupe was introduced as a drug and are used to cure different diseases (1,4 and 6). Calendula is native to the Mediterranean region, but across Europe and around the world is planted as an ornamental plant. It is now used as a medicinal herb (1 and 4).

Calendula herbaceous (*Calendula officinalis* or Potmorigold) from Asteracease is an annual or perennial plant which the lower part of the stem is woody. Its cone root goes directly into the soil at a depth. The plant stalk height is 40 to 70 cm and is much branched. Wide or even lying calendula branches are leafy end. The leaves are light green and shaped like a spear head, oval, entire or slightly toothed margins are slim. In the area there are downy leaves and tubers (4 and 5). Growth of calendula is long (between 20 to 21 days). If the weather is very cold in autumn, and the temperature will drop below freezing, the plant will not be capable of managing the life cycle (4). Calendula is native to the Mediterranean region, but is well adapted to the climate of North West Europe. Calendula has the time of rapid growth and development, as 40 to 50 days after emergence, the flowers are created. If the flowers are picked just after opening, the new reproductive buds arise. In Iran, the first flowers appear in late spring and late autumn before the onset of cold weather will continue this trend continues (2,4 and 5). The plants grow needs to overheat and sunlight. It is able to tolerate drought well. It buds in 8-10 degree after 4 or 5 days. This plant is grown in areas where the average temperatures in May and June are July 17 to 18 ° C and 19 to 20 ° C will be successfully grown. It tolerates the low degrees very well. Even for a limited period, is able to withstand temperatures well below zero (4,6 and 1). Although the plant produces beautiful flowers in poor soil, but in these situations the minimum amount of active ingredient reaches its petals. Texture soils calendula planting should be done in a way that is easy to operate air. Heavy clay soils are therefore not recommended. This plant should not be planted more than two years in a given field (4). Much nitrogen is not suitable for that, because it stimulates growth and reproductive growth and thus reduces the number of flowers. Application of 60-50 kg N, 80-6 - 100 to 80 kg phosphorus and oxidized acid Potasin kg per hectare to the soil during land preparation in autumn and the roads between June and July will be good for plants. It should be noted that the addition of nitrogen is in the spring, and the plants are done growing (4 and 6). Late winter and early spring is a good time to plant calendula. Seeds are planted with row spacing of 50-40 cm between plants in the row at a depth of about 5-8 cm long and 3-2 cm are planted (4). Amplification by amaranth cultivation and direct seeding is done. 5 – 7 seeds with high quality are needed for each hectare. The product dried flowers with 2-1 sepals and sepal's 400-350 kg ha-ha (2, 3). Calendula petals yield is 38 tons per hectare (2). The full caps flakes or the petals separated from the receptacle form the medicinal part. Dried calendula petals water containing 10-8 per cent, 10-9 per cent minerals, small amounts of salicylic acid and 02/0 percent of oil with a characteristic odor, is colorless (1 and 2). Calendula is used orally for the treatment of gastritis and a topical treatment for skin inflammation, eczema and dry skin (4 and 3). Density per unit area, which maximizes the performance of a particular product in a particular situation, is yeast. Yazdani, et al. (6) conducted an experiment on the petals and reported that the effect of density on dry matter yield, grain yield, harvest index, number of branches, plant height and stem diameter were significant at 1% level. Peppermint is one of the most widely used herbs in the world oil annual consumption is about 7,000 tons. Its flowers are purple and red capsule that has its fruit without seeds or vegetative branches. Peppermint plant hybrid that has arisen spontaneously in nature and its parent are *M.spicata*, *M.aquatica*. Leaves of this plant are known for its spicy taste of peppermint is called. Some of the scholars know the Asia as its origin and some other believe that it originated in England. This plant is not native to our country, but it is widely cultivated in most provinces. This plant can be



planted in most areas, but in terms of long days and high humidity and temperatures 18 to 20 degrees is the best of quantitative and qualitative performance. Because of its shallow roots must be watered at short distances and relatively large amounts and sandy loam soils with high humus content and pH 5 to 8 would be happy with it.

## Material and Methods

The experimental research station in 2006 in East Azerbaijan Research Center for Agriculture and Natural Resources came into force. The seeds of calendula herbs and peppermint were used. The used seeds were supplied by faculty of Agriculture, University of Mohaghegh Ardabili. The factorial experiment was conducted with a completely randomized design to evaluate the effects of planting date and density on calendula herbs and peppermint. After grinding and land clearing drive the atmospheric stack cm50 intervals was done by shovel. After opening flowers, the harvest picked by hand and one time per day, and immediately transferred to the laboratory for weighing. After weighing and taking notes, flowers were placed in the open air for drying. After drying in the open air and environmental shadows, two weighed to determine dry weight. Essence of the Plant was reached in Khosroshahr plant medical clinic. In both plant traits: wet flower weight, height, number of leaves, dry weight, and dry weight of flowers.

## Results and Discussion

The results of variance analysis showed that the effect of planting date and plant density on leaf number, plant height, dry weight, dry weight of flowers on a meaningful level. Combination treatment plant planting date was significant for all traits studied. So it can be concluded that the two planting dates, in different densities of these traits were not different from the responses.

Table1. Analysis of variance of different characteristics of calendula herb

SOURCE OF VARIATION	df	Leaf number	stem dry weight	Flower dry weight	Height
Replication	2	1540/058**	37061/27**	7083/53**	361/86**
Plant date	1	4784/70**	181922/336**	47879/98**	2242/66**
Plant density	3	522/95**	21061/42**	8998/033**	220/64**
Date and density	3	216/184	308/152	19/748	10/03
Error	14	126/527	1157/985	56/763	10/882
C.V.(Coefficient of variation)%	-	19/23	9/09	4/27	7/53

\*and \*\* significant at level 5% and 1%, respectively.

Table2. Analysis of variance of different characteristics of peppermint herb

SOURCE OF VARIATION	df	Leaf number	stem dry weight	Flower dry weight	Height
Replication	2	986/038*	47561/20**	8093/593**	260/81**
Plant date	1	235/75**	201922/06**	50876/90**	1242/22**
Plant density	3	125/90**	11071/40**	9990/003*	329/64**
Date and density	3	110/084	411/102	20/008	20/09
Error	14	77/002	2102/905	60/063	15/802
C.V.(Coefficient of variation)%	-	9/24	15/00	10/20	21/03

\*and \*\* significant at level 5% and 1%, respectively.



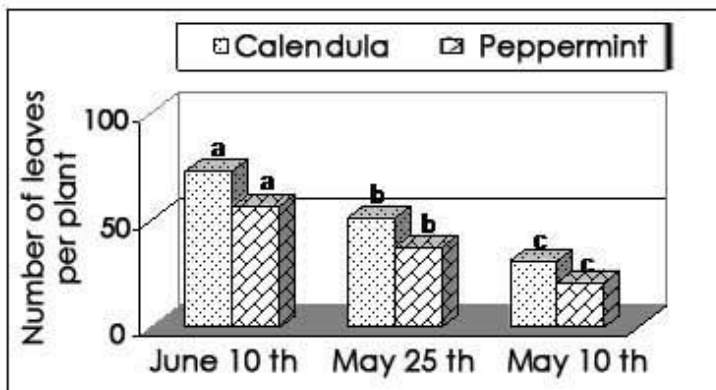


Figure1. Comparison of the mean number of leaves per plant for various planting dates

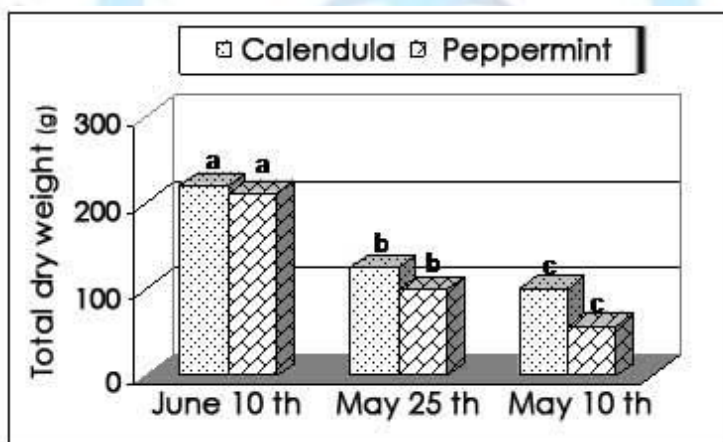


Figure2. Comparison of the mean the total dry weight of the plants for various planting dates.

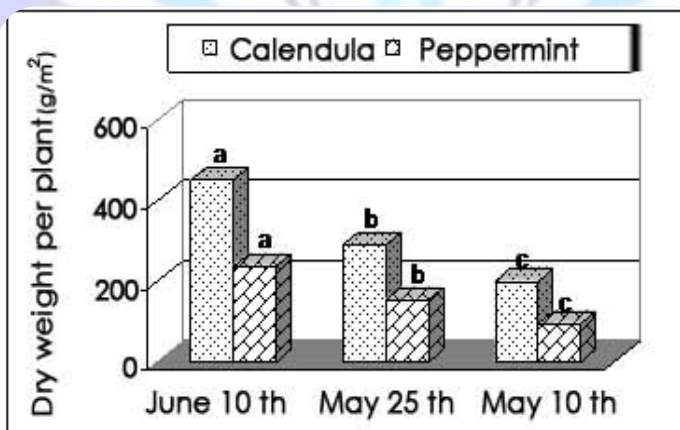


Figure3. Comparison of the mean dry weight per plant for various planting dates

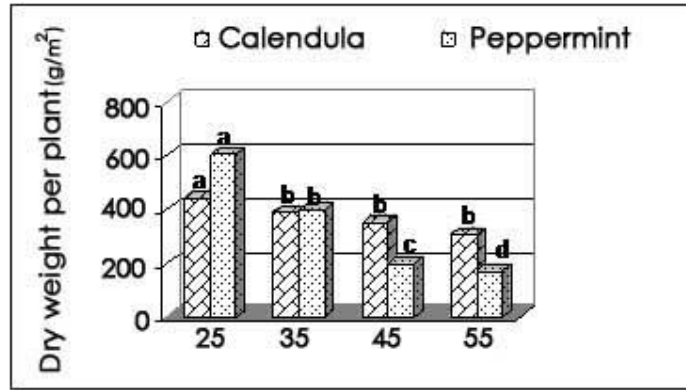


Figure4. Comparison of the mean dry weight per plant for various planting densities.

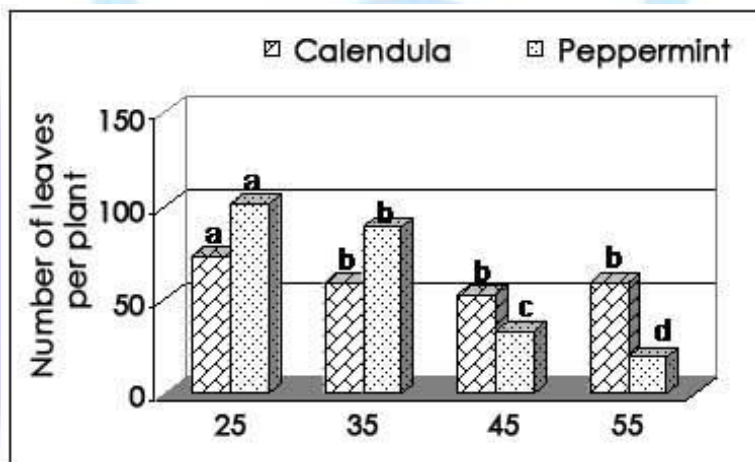


Figure5. Comparison of the mean number of leaves per plant for various planting densities.

According to the results of this study, planting date can affect the performance of marigold and peppermint, generally on the first planting of better results were obtained for all traits measured. So that the first planting date, plant height, leaf number, dry weight and dry weight of flowers was the second planting date. So it can be concluded that the seeds be planted calendula peppermint earlier (in appropriate circumstances) the efficiency and performance will increase. High plant populations, the height, the size of each plant reduce, Number density increases, due to the increased number of flowers per unit area increases. Plant size due to reduced lateral branches were more uniform this uniform distribution of flowers per plant, and can be considered as a positive trait for manual and mechanized harvesting. The results showed that the highest dry matter yield of calendula flowers for 211/9 grams per square meter and the density of 55 plants per square meter, and a minimum of 125/75 grams per square meter density of 25 per square meter. In this study, planting date (10 June) and a density of 55 plants per square meter as the best treatment for peppermint marigold and performance are introduced.

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