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Research Article

EFFECT 0F BIOLOGICAL COMPETITION OF WEEDS ON GROWTH AND VOLATILE OIL YIELD OF MARIGOLD (*CALENDULA OFFICINALIS* L.) AS MEDICINAL PLANT USED IN HERBAL MEDICINE OF IRAQ

[1]IBRAHIM S. ABAAS

[1]Department of Pharmacognosy and Medicinal plants, college of Pharmacy, University of Kerbala, Iraq. Email: ibrahim993@yahoo.com

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ABSTRACT

Objective: The study was designed to evaluation the effect of weed competition on growth parameters and volatile oil of marigold flowers.

Methods: The experiment was included four treatments were weed free, weed infasted, black plastic mulch and white plastic mulch. The samples for study were randomly collected from the middle rows of each plot. The volatile oil was obtained by steam distillation.

Results: The Results referred to all growth parameters of marigold were reduced by weed competition copared with weed free treatment as control treatment. Black plastic mulch was gave highest growth values than all treatment, and reached to 25.8 plant $^{-1}$, 41.25 cm^2 plant^{-1}, 25.40 plant^{-1}, 25.10 plant $^{-1}$ and 905 kgha $^{-1}$ for basal branches, leaf area, flower branches, number of inflorescences and yield of inflorescences receptively. The highest value of volatile oil percentage and volatile oil yield were obtained at black plastic mulch, and reached to 0.930% and 8.410 L ha^{-1} respectivly.

Conclusion: From this study the results and discussion, it has been concluded that weed removes is necessary to prevent any significant yield losses of marigold. Plastic mulch may be considered effective weed control tools and appropriate for medicinal plants

Keywords: Medicinal plants, Marigold, *Calendula officicnalis.*

INTRODUCTION

Marigold (*Calendula officinalis* L.) its belong to Asteracea family, was considered among the most important medicinal and food plants[1]. Several species of this plant are widely distributed in different Mediterranean countries.

Marigold is an aromatic annual, seldom biennial. It grow between 30 and 50 cm high, and has about 20 cm long tap root and numerous thin secondary roots [2]. The stem is erect, angular, downg and branched from the base up or higher. The alternate leaves are almost spatulate at the base, oblong to lanceolate above and are all tomentosae [3]. On the tip of each stem, there is a 5 to 7cm composite flower head, as shown in Fig (1), consisting of an epicalyx of numerous narrow lanceolate sepals, which are densely covered on both sides with glandular hairs. The inner section of the flower head is made up of orange-yellow tubular florets.

Marigold flowers are contain maximum volatile oil at full flowering stage, various monoterpenes and sesquiterpenes have been reported in the volatile oil such as cadinene, cadinol, t-muurolol, Limonene, and 1,8-cineol with p-cymene at lower leaves at the post flowering periods [4].

Fig. 1: Picture of Marigold plant

Marigold is stated to possess antispasmodic, mild diaphoretic, anti-iflammatory, anti-hamorrhagic, emmenagogue, vulneray, styptic and antiseptic properties [5].

Competition is purely a physical process begins when the available supply of any single essential factor falls below the combined demand of the interacting plants [6]. The ability of plant to obtain light, water and nutrient determine the success of that individual in an environment.

Medicinal plants are generally weak competitions and suffer from heavy infestation of many annual weeds. This weakness is due to different factors including the lack of good canopies and root system, high needs for nutrients and weak resistance to severe environmental conditions [7].

The basic information concerning the effect of weeds on growth and volatile oil yield of this plant is rare. Therefore, this study was

carried out to evaluate the effect of weed competition on growth and volatile yield under field condition.

MATERIAL AND METHODS

Field experiment was conducted to study the effect of weed competition on growth and volatile oil yield during 2012-2013 growing season, at medicinal plants garden of Pharmacy College at karbala university. The soil is a sandy loam of 50% sand, 25% silt and 25% clay with 1.3% organic matter content and ph of 7.5. Two plowing operations were done, one by chisl to a depth of 20 to 25cm then followed by rotary cultivator. Two –month-old marigold seedlings with an average height of 10 cm were used. Hardening was accomplished before transplanting by exposing seedlings to the outside environmental temperature and adapting them to field conditions during winter season. NPK fertilizer (18,10,16) was added one month after transplanting at 250 kg $ha^{-1,}$ then anther application was done two month later using the same amount. Plot area was 1*2 cm^2, with 50 cm left between plants and between rows. Eight seedlings were transplanted in two rows per plot area. Alleys 0.5 cm were left separating the plots and 2cm between blocks.The Experiment was included four treatments were weed free, weed infested, black plastic mulch and white plastic mulch. All treatments were laid out in a randomized complete block design with three replicates.

The samples for study were randomly Collected from the middle rows of each plot.

Chemical analysis

The volatile oil of marigold flowers was obtained by processes of steam distillation. [8,9]. Hundred grams of flowers were submitted to hydro distillation with a Clevenger-type apparatus [10] The physical constants of the essential oil were determined at 20 C^0 and included: specific gravity, refractive index and density.

The data recorder was subjected to analysis of variance at least significant difference (L.S.D), at 0.05 levels compare the means of characters [11].

RESULTS

1. Growth parameters

The effect of weed competition on marigold growth was presented in table (1). All growth parameters of marigold were reduced at all treatments axcept black plastic mulch was compared with weed free treatment as control treatment.

The number of basal brarches per plant, leaf area per plant, flower branches per plant, number of inflorescences per plant and yield of inflorescences per plant were significantly increased compared with weed infested treatment. Black plastic mulch was gave highest growth values than all treatments, and reached to 25.8 plant $^{-1}$, 41.25 cm^2 $plant^{-1}$, 25.40 $plant^{-1}$, 25.10 $plant^{-1}$ and 905 kg ha^{-1} for basal branches, leaf area, flower branches, number of inflorescences and yield of inflorescences respectively. While the reduction in all growth parameters was obtained at weed infested treatment and reached to 9.162 $plant^{-1}$, 4.743 cm^2 $plant^{-1}$, 1.66 $plant^{-1}$, 2.441 $plant^{-1}$ and 19.61kg ha^{-1} for basal branches, leaf area, flower branches, number of inflorescences and yield of inflorescences respectively.

2. Volatile Oil Parameters

The effect of weed competition on volatile oil of marigold plant was presented in Table (2). The highest value of volatile oil percentage and volatile oil yield per hectare were obtained at black plastic mulch, white plastic mulch and weed free treatments and reached to (0.930% and 8.410 $L.ha^{-1}$), (0.837% and 6.742$L.ha^{-1}$) and (0.818% and 5.060 L ha^{-1}) respectively. The lowest values of volatile oil percentage and volatile oil yield were obtained at weed infested treatment and reached to (0.359% and 0.105) and (0.115 and 0.008) respectively. The increasing of both growth and volatile oil parameters was obtained with decreasing of weed dry weight.The weed dry weight and weed species were shown in Tables (3) and (4).

DISCUSSION

The effect of weed competition depends on growth habits of weed species, number and density of weeds, stand and spacing of the crop, climatic factors, soil moisture and natural shading of crop and weeds [12,13]. Data of the present study showed that the longer time of weeds remained with marigoldwas gave the greater reduction in growth and volatile yield. This may be due to plant suffering from competition for water, nutrients at early growth stages, and shading effects offered by the tall growing weeds late in the season, especially deeply rooted and allelopathic. In semi-arid regions, water and nutrients are normally in a short supply, and competition for such factors may start early in the season. Black plastic mulch treatment was highly effective in controlling weeds at this semi-arid location becouse this weed control method may be affect on weed germination and growth by preventing light for photosynthesis. In addition, it might allow other advantages to medicinal plants through conserving soil moisture and providing good soil condition for root growth [14]. From the foregoing results and discussions, we were concluded that weed removal is necessary to prevent any significant yield losses of marigold and weed competition for the whole season can lead to complete plant failure. Plastic mulch and hand weeding may be considered effective weed control tools and appropriate for medicinal plants.

Table 1: Effect of Weed Competition on Growth Characteristics of Marigold plant

Treatments	N B $Plant^{-1}$	L A (cm^2 $plant^{-1}$)	F B $Plant^{-1}$	N F $Plant^{-1}$	Y N F ($Kg.ha^{-1}$)
Weed free	13.7	30.75	15.50	17.40	545
Black plastic mulch	25.8	41.25	25.40	25.10	905
White plastic mulch	17.28	33.8	18.75	20.18	725
Weed Infested	7.75	13.30	7.22	6.25	271
L S D (P=0.05)	9.162	4.743	1.66	2.441	19.61

N B = Average number of basal branches per plant; L A = Leaf area per plant; F B = Flower branches per plant; N F = Number of inflorescences per plant; YNF=Yield of inflorescences per hectare

Table 2: Effect of Weed Competition on Volatile Characteristics of Marigold plant

Treatments	Vol. oil %	Vol.Y.L ha^{-1}	S. P	D	R I
Weed free	0.818	5.060	0.950	0.933	1.400
Black plastic mulch	0.930	8.410	0.952	0.937	1.495
White plastic mulch	0.837	6.742	0.950	0.934	1.491
Weed Infested	0.558	2.520	0.945	0.930	1.395
L S D (P=0.05)	0.359	0.105	0.115	0.008	0.106

VOL.OIL (%)= Volatile oil percentage; VOL.Y.Lha^{-1} = Volatile oil yield (litter per hectare); S.P = Specific gravity of volatile oil; D. = Density (mg/ microliter) of volatile oil; R I = Refractive index of volatile oil

Table 3: Effect of different treatments on weed dry weight (Ton per hectar)

Treatments	Weeds dry weight (Ton $ha^{-1)}$
Weed free	0.00
Black plastic mulch	0.00
White plastic mulch	1.33
Weed Infested	4.50
L S D (P=0.05)	0.080

Table 4: Main weed species in the experimental area

Weed species	Families
Malva sylvestris L.	Malvacea
Sonchus oleraceaus L.	Compositae
Chenopodium murale L.	Chenopodiaceae
Cynodon dactylon L.	Graminaceae
Lactucd serriola L.	Compositae
Sinapis arvensis L.	Cruciferae
Convolvulus arvensis L.	Convolvulaceae

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