

The influence plant spacing on growth and volatile oil quantity and quality of belangu plant (*Lallemantia royleana* wall .) as medicinal plant used in traditional medicin in Iraq

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Abstract :

Field experiment was conducted during winter season of 2010 – 2011 at medicinal plants garden of pharmacy collage of Baghdad University to evaluation the effect of planting spaces between plants on growth parameters and volatile oil quantity and quality .

The results were showed the space at 40cm between plants was gave a highest values of total fresh yield , total dry yield , fresh leaf weight , dry leaf weight and number base of branches per plant were reached to 1187 kgha⁻¹ , 448.18kgha¹ , 518 kgha¹ , 216 kgha¹ and 25 branche per plant respectively .

The quantity and physical properties of leaf volatile oil also increasing with increasing the planting spaces among plants . The highest values of volatile oil percentage , volatile oil yield per hectar , specific gravity , density and refractive index and these values were reached to 2.75% , 14.24Lha¹ , 0.980mg /microliter , 0.941mg/microliter and 1.520degree respectively at 40cm as planting space between plants .

تأثير مسافات الزراعة على نمو وكمية ونوعية الزيت الطيار لنبات البنكو (*Lallemantia royleana* wall .) المستخدم في الطب الشعبي في العراق

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الخلاصة

أجريت دراسة حقلية في الموسم الشتوي 2010 - 2011 في حديقة النباتات الطبية التابعة لكلية الصيدلة - جامعة بغداد لتقييم تأثير مسافات الزراعة بين النباتات على مواصفات النمو وكمية ونوعية الزيت الطيار .

أشارت نتائج الدراسة أن مسافة الزراعة (40 سم) بين النباتات قد أعطت أعلى القيم للحاصل الطازج والجاف الكلي ووزن الاوراق الطازجة والجافة وعدد الافرع القاعدية للنبات الواحد وقد كانت (1187kgha⁻¹ ، 448.18kgha¹ ، 518kgha¹ ، 216kgha¹ و 25 فرع / نبات على التوالي .

كما ان محتوى الاورق من الزيت الطيار وصفاته الفيزيائية كذلك ازدادت مع زيادة مسافات الزراعة بين النباتات وان أعلى القيم لنسبة الزيت الطيار وحاصل الزيت الطيار في الهكتار ، والوزن النوعي وكثافة الزيت ومعامل الانكسار قد وصلت الى 2.75% ، 14.24 لتر / هكتار ، 0.980 ملغم / مكرو لتر ، 0.941 ملغم / مكرو لتر و 1.520 درجة على التوالي عند المسافة 40 سم بين النباتات .

Introduction :

Medicinal plants are generally effected by different factors including the lack of good canopies and root system , high needs for nutrients and weak resistance to severe envromental conditions (1) . Also the growth parameters with active compounds quantity and quality affected by field practices such as irrigation , fertilization , planting date , planting spaces and others (2) . The Belong plant to

labiatae family is considered among the most important medicinal and food plants are used in different assian and mediterranean contries for herbal remedies or medicine (3) .

This plant is grown in north of Iraq and neighboring countries such as Iran , its called by its popular name Belangu (4). The ripe fruits of belangu accomodate an important essential oil , which contains the active constituents such as mixed fatty acids (olic , linolic , linalonic and palmitic acid) , all the ripe seeds are contain the high quantity of mucilage (5), The seeds are used as diuretic , laxative , heart stimulant and cough with external use for carbuncle treatment (6) .

The volatile oil quantity and quality are affected by vegetative growth such as leaf yield , plant height number of base branches per plant (7) . Iraqians are heavily consumption of seeds of this plant by preparation the cold drink especially during summer season .

There are no studies reported on cultivation or production in Iraq and very limited in other countries . This study was carried out to :

- 1- Conducted the first experiment in Iraq to cultivation this plant .
- 2- Determination the best space between plants and evaluation the effect of planting spaces on growth parameters and volatile oils quantity and quality .

Materials and Methods :

Field experiment was conducted during the winter season of 2010 at the medicinal plant garden of pharmacy collage of Baghdad university. Iraq .

Belangu seeds were obtained from Baghdad markets (Shoraga market) and classified by national herbarisim of Agriculture ministry , then were sown on November 10th in hill by RCBD (Randomized Complete Block Design) with three replication , the area of each plot (4m²) contained 4 rows , the distance between rows , was (½ m) the distance between replicates was (2m) . Planting spaces were (10 , 20 , 30 , 40) cm between belangu plants .

The soil is clay loam (63.2% clay , 37.7% silt , 1.1% sand) which contained 0.7 organic matter and has a pH of 7.5 . During the experimental season , N-P-K fertilizer (18 : 10 : 16) was added one month after sowing at 250 kg^{ha}⁻¹ , then another application was done two months later using the same rate .

The samples were take from middle rows of each plot randomly . The volatile oil of belangu seeds was extracted by steam distillation (Clevegar and guenther, 1948), the physical properties of volatile oil were determined included specific gravity , density and refractive index by Guenther method (1972).

All data recorded were subjected to analysis of variance and lest signification defference (L.S.D) at 0.05 level implemented to compare the means of characters studied .

Results and Discussion :

1- Growth parameters

The effect of planting spaces on belangu growth is shown in table (1) and (2). Spaces between plants showed significant effects on the all growth parameters . Planting space of (40 cm) caused greatest increasing in total fresh and dry yield , fresh and dry leaf weight compare with other spaces and reached to 1187 kg^{ha}⁻¹ , 448.18 kg^{ha}⁻¹ , 518 kg^{ha}⁻¹ and 216 kg^{ha}⁻¹ respectively , while the lowest values were obtained at (10 cm) as space between plants .

The belangu plants were responded significantly to increasing of spaces between plants due to decreasing the effect of competition among plants on all growth factors such as water , light and nutrient with increasing of planting spaces among plants, and the similar trend was obtained with leaf production (8).

In table (1) the results were shawed the significant effect of increasing of space planting on number of base branch per plant while the plant height was decreases by increasing the spaces among plants because the none infestation or competition on light factor which case the laucelules of plants (9) . Howere the higsht value of number of base branch was obtanted at (40cm) space and reach to 25

branch per plant . On the other hand , a strong correlation was obtained between leaf dry weight of belangu and space planting (figure 1) .

The significant increasing in growth parameters due to the increasing activity of metabolism and photosynthesis processes . Leaf dry weight reduction at 10 cm space was 45% due to the more density of infestation among plants on different growth factors (10) .

2- Percentage and yield of volatile oil :

Increasing of spaces between belangu plants was caused significant increasing of values of percentage and quantity of leaf volatile oil , the highest value of volatile oil percentage and volatile oil yield per hectare were obtained at 40 cm planting space and reached to 2.75% and 14.24 Lha⁻¹ respectively (Table 2) .

The significant increasing of volatile percentage and yield of volatile oil with increasing of planting space due to increasing the metabolism and photosynthesis processes and their secondary metabolites such as volatile oil (11).

3- Volatile oil quality :

Also the increasing of spaces between belangu plants was improving of physical properties (specific gravity , oil density and refractive index) . The highest values of these properties were obtained at (30 and 40) cm and reached to (1.504 and 1.520) degree , (0.901 and 0.941) mg / microliter and (0.976 and 0.980) mg / microliter respectively (Table 3) . This significant increasing of these physical properties by increasing space due to accumulation oxygen compounds which solid compounds in belangu volatile oil by increasing the secondary metabolites of physical properties .

Average data showed that belangu volatile oil yield was significantly reduced by plants competition at 10 cm space .

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Table (1) Effect of planting spaces on total fresh yield (TFY), total dry yield (TDY) , number of base branches per plant (NB) and plant height (H)

Spaces (cm)	TFY (kg ha ⁻¹)	TDY (kg ha ⁻¹)	NB (plant ⁻¹)	H (cm / plant)
10	608	237.9	8	55.2
20	795	310.08	12	48.3
30	1072	403.85	18	40.8
40	1187	448.18	25	38.5
L.S.D (P= 0.05)	20.56	10.51	0.84	7.2

Table (2) Effect of planting spaces on leaf fresh weight (LFW) , leaf dry weight (LDW) , volatile oil (VO)% and volatile oil yield (VOY)

Spaces (cm)	LFW (kg ha ⁻¹)	LDW (kg ha ⁻¹)	VO %	VOY (L / ha)
10	295	118	0.62	1.83
20	310	156	1.21	3.75
30	450	202	1.98	8.91
40	518	216	2.75	14.24
L.S.D (P= 0.05)	18.22	15.42	0.37	0.93

Table (3) Effect of planting spaces on physical properties of Belangu volatile oil

Spaces (cm)	Refractive index (degree)	Specific gravity mg / micro liter	Density mg / micro liter
10	1.491	0.944	0.482
20	1.498	0.959	0.494
30	1.504	0.976	0.901
40	1.520	0.980	0.941
L. S. D P= 0.05	0.101	0.001	0.030

Fig. (1) The correlation between LDW and planting spaces .

