ISSN 1991- 8690 الترقيم الدولي ١٩٩١ - ٨٦٩٠
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PRODUCTIVITY OF KENAF CROP (*Hibiscus cannabinus L.*) BY EFFECT MANY PLANTING DATES IN BASRAH GOVERNORATE

2-For seed and oil production

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Abstract

In order to evaluate the productivity of kenaf (*Hibiscus cannabinus L.*)for seed and oil production ,this study was conducted during the growing season of year 1998 and 1999 to determine the productivity of three varieties (Vit11,Vso1and the local variety as a control) by effect four planting dates (20February,10March,30March and 20 April) on seed yield ,seed yield components , oil percentage and oil yield. The experiment design in both years was randomized complete block, replicated four times. The treatments were in a split plots arrangement where planting dates constituted the whole plots and varieties the sub plots. Seed yield differences were observed among varieties, planting times and their interaction .The local variety (the control)gave the highest seed yield (921.5 g /m^2) when planted on 30 March followed by the variety Vso1(696.9 g /m^2)then the variety Vit 11 gave the lowest seed yield (441.4 g /m^2)when they planted on the same date. Earlier planting date and later than 30 March reduced the seed yield of all varieties significantly. Seed yield differences among varieties were the consequence of differences in number of capsules/plant and number of seeds/capsule. The results also showed that the low1000 seed weight of the local variety was compensated by the high capsules /plant and seeds / capsule to give higher seed yield. Earlier planting date and later than 30 March reduced yield components especially number of capsules/plant and seeds/capsule and that reflected on seed yield result among planting dates. The local variety gave the highest oil percentage (9.5%) and oil yield (87.5 g/m^2) when planted on 30March..Delayed planting date reduced oil yield to all varieties due to reduce seed yield .It was concluded that once proper agriculture practices are known and employed the kenaf crop could have a future prospect under Basrah environmental conditions .

INTRODUCTION

Kenaf crop (*Hibiscus cannabinus* L.)is an old crop use to be grown in limited area in the south of Iraq. Internationally the crop known as a fiber crop specially for paper pulp making ,study some of the agronomic factors affected fiber production in Basrah have been reported by Majid(2003) and was found that the imported Vietnams varieties out yield in quality and quantity for paper pulp the local variety. In some areas kenaf crop is cultivated for production of edible oil from the seeds. Singh(1991) reported that more than 16.8% oil could be obtained in Barrack por-India,Wachjar *et al*. (1994) reported at Tajur experiment station in Indonesia that increased photosynthesis and K nutrient increased significantly plant high,stem diameter, seed yield component and oil percentage.Ghrbin(1999) in southern Italy examined the influence of some growth regulator.
(BONA,NAA,BONA+NAA+NAD and GA3)on plant height and seed and oil yield .He found a appositive influence of some growth regulator (BONA+NAA+NAD and GA3) on flowering pattern and plant height, resulted in higher seed and oil production. Since kenaf crop have been proven to grow successfully as fiber crop under Basrah environmental condition (Majied, 2003) this research was conducted to know whether this crop could be grown as dual purpose for fiber and oil production .Since no scientific information are available concerning the effect of major agronomic practice on seed and oil production, therefore the objectives of this study are :

1-To investigate the prospective of the kenaf as an oil crop with emphasis on the local variety.
2-Determining the optimum planting time for maximum seed and oil production 3-To study the effect of planting dates×varities interaction on seed and oil production

MATERIALS AND METHODS

The field experiments were conducted at the field near by the paper industries company located 40km north Basrah town .The experiments were carried out during the spring seasons of 1998 and 1999. The experiments were planted on soil their physical and chemical properties are presented in Table 1.The experiment design for both years was randomized complete block replicated four times with treatments in a split –plot arrangement. Planting dates (20February, 10March, 30March and 20 April) constituted the whole plots and varieties the sub plots. The varieties included the local variety as a control and the imported varieties from Vietnam Vit11 and Vso1 (Imported mainly for paper pulp making by the company).Prior to plots making, land was cultivated and leveled. All plot received 60 kg/ha nitrogen and 40 kg/ha phosphorus fertilizer as (NPK) form at planting and 40 kg/ha N fertilizer after 40 days from planting as urea form (46%N).

Table 1:Soil characteristics (to depth 25cm) and weather date for 1998 and 1999 seasons

year	N%	P%	K%	O.M	E.C	PH	Clay	Sand	Silt	Texture
1998	.0680	0.001	0.04	1.1	6.1	7.2	21	19	60	Silt-loam
1999	0.05	0.003	0.03	0.9	4.9	6.7	16	14	70	Silt-loam

1999			1999	
Month	Mean Temp.C°	Rainfall mm.	Mean Temp. C°	Rainfall mm.
Jan.	14.7	18.2	15.8	29.4
Feb.	16.5	19.0	16.1	18.2
March	19.7	26.61	21.1	15.8
April	31.9	15.1	28.3	15.0
May	33.5	-	31.7	7.0
June	36.6	-	35.3	-
July	38.7	-	43.1	-
Aug	39.0	-	40.1	-
Sept.	34.9	-	37.0	-
Oct.	29.8	1.9	30.1	6.7
Nov.	18.7	28.11	23.3	23.1
Dec.	14.1	26.7	17.1	29.9

All plots received full irrigation and maintained weed free by hand weeding after sowing whenever necessary. Seed were planted on ridges spaced 60 cm, 3-4 seed /jab, spaced 15cm then thinned to one plant at 2-3 leave stage. Each experimental unit consisted of four rows 5m long, a border of 0.75m wide left between each plot .Date on the following characteristics were obtained from each plot.

Number upper branches: the mean of upper branches from five selected plants from each plot were taken.

Yield components: included the mean of number of capsules /plant, number of seeds /capsule and 1000 seed weight were taken from the five selected plants in each plot .

Seed yield: was obtained from the two center ridges of each plot. Capsules were hand harvested and threshed.Measurement was done on the basis of 10% moisture .

Oil percentage:three samples (35g each) from harvested seed for each plot were dried and the mean of oil percentage was determined by Soxhlet method (AOAC, 1980).

Oil yield: Obtained from seed yield multiplied by seed percentage. For analysis of variance, years were considered as random effect while varieties and planting dates were considered fixed effect. Error variance from separated analysis of the data were tested for homogeneity following procedure in reference Gomes and Gomes (1984)and was found homogenous Thus a combined analysis across years was calculated. Treatment means were compared using protected LSDat $p< 0.05$of significant.

Results and Discussion:

Yield components

Seed yield of the kenaf crop per unit area is a function of yield components: number of capsules / plant , number of seeds/ capsule and seed weight , in addition to the number of plants per unit area (which fixed to all treatments in this study) Thus ,if there was any yield differences among treatments it would be due to difference in one or more of these components .However

,the results showed that the number of capsules /plant were significantly different among varieties planting date and their interaction. in effect,the control variety (local) gave the highest number of capsules/plant (106.2) while the other varieties had similar capsules/plant(73 and 72.5capsules/plant for the variety Vss1,respectively(Table2).Planting on 30march gave higher capsules/plant (101.9) than other planting dates except planting on 10 March which had similar capsules/plant planting on 30 march. However, the varieties responded differently to planting dates in such that the control and Vso1 varieties gave their highs capsules/plant when planted on 30 march (124.9 and 95.7 capsules/plant, respectively) while the variety Vit11 gave its highest capsules/plant when plantedon10March (94.1capsules/plant) (Table3) The results in Table 3 showed that the control variety gave higher number of capsules/plant than other varieties at all planting dates. This variation was mainly as consequence of difference in number of branches/plant which carried most of the capsules and the results of the two variables, number of branches /plant and number of capsules/plant were similar in such that the control variety, planting on 30 march and their interaction had the highest number of branches than the other treatments (Table 2 and 3).There was a significant effect of variety ×year interaction on number of capsules/plant. The varieties Vit11 and Vso1 had higher number of capsules /plant in year 1999(84.7 and 79.6 capsules/plant, respectively) compared to year 1998 (61.3 and 65.4 capsules/plant ,respectively)(Table 4).While the control variety had no significant different in both years This result may indicate that changing environment specially soil with lower EC (Table 1) affect the performance of the imported varieties (Vit 11 and Vso1)more than the local variety which seem to be more stable to changing environment Planting after 20 February increased number of seeds /capsules to all varieties but the increase was different from one variety to another in such that the control variety increased 55.5% when planted on 30 march compared to 20 February while there were 70 and 53.3% increased for the varietiesVit11andVso1,respectively(Table3). However ,the varieties Vit11andVso1gave its highest number of seeds When they were planted on 20 April (23 and 24 seeds/capsule, respectively)while the control variety gave its highest seeds/capsule when planted on 30 March and 20 April (Table 3).As mean effect the control variety gave the highest seed number/capsule (24) followed by Vso1 (20)while the variety Vit 1 gave the lowest (16) (Table 2) ,also there was a tendency to increase seed number/capsule with delay planting date. It was found that years had no significant effect on seed number per capsules.Averaged over varieties and planting dates years didn't significantly different in number of seeds /capsule(Table 2)but the varieties Vit 11 and Vso1tend to be higher in season of year 1999 compared to 1998 (Table 4).The favorable results of the imported varieties in number of capsules/plant(Table 4) and seeds /capsule in 1999 compared to 1998 season may attributed to the better response of the Vietnam varieties to the favorable environment and to the adaptability of the old variety (the control) to the changing environment .The control variety gave similar 1000 seed weight in all planting date while planting on 20 April reduced the 1000 seed weight of Vit11and Vso1(Table3). However the varieties Vit 11 and Vso1had higher 1000 seed weight in all planting date than the control except on 20 April where they had similar 1000seed weight .The higher 1000 seed weight of the varieties Vit 11 and Vso1 at earlier planting dates may be

due to lower seeds number /capsule(Table 3)resulted in enough assimilate to fill the available productive sink (the seeds).As main effect the varieties Vit 11 and Vso1 gave significantly higher 1000 weight than the control (26.4 and 25.1g) respectively (Table 2).Year 1998gave significantly higher 1000 seed weight (26.1g) compared to 1999 (22.9g) planting on 30March gave significantly higher 1000 seed weight (26.4g)than other planting dates except planting on 10 March which gave similar 1000 seed weight (24.6g)(Table2).

Seed yield:

Averaged over the two years and four planting dates, the control variety gave significantly the highest seed yield(648.3g/m^2)followed by Vo1(408.5g/ m^2)While the variety Vit 11 gave the lowest seed yield (315.8 g/m^2) (Table2). The varieties also performed differently in both years specially the varieties Vit11 and Vso1 where they had higher seed yield in year 1999 compared to year 1998 .The seed yield of the Vit11 and Vso1 were 332.4 and 535.4 g/m^2),respectively for year 1999 while in year 1998 they gave 299.0 and 281.6 g/m^2),respectively (Table 4).The control variety gave similar seed yield in both years and were higher than other varieties (Table 4).The varieties also had different seed yield in different planting dates and that is due to the significant interaction effect of the variety ×planting dates on seed yield. The control variety gave its highest seed yield when planted on 30March (921.5 g/m^2) followed by planting on 20April (796.8 g/m^2) (Table 3) .Early planting (on 20February) reduced yield of the control variety by 61.5% compared to the planting on 30March .The varieties Vit11 and Vso1 also had their highest seed yield when planted on 30March (441.4 and 696.9 g/m^2respectively) but delayed planting till 20April reduce seed of the variety Vit11 by 54..4% and by 71% for the variety Vso1 compared to planting on 30March (Table 3). Seed yield variation among treatments was mainly due to variation in seed yield components .The high number of capsules/plant and number of seeds/capsule of the control variety gave it the highest seed yield despite its low 1000 seed weight which compensated by other components. Also the high seed weight of the varieties Vit11 and also Vso1(compared to the control variety) was not enough to give higher seed yield than the control because of the lower of other components number of capsules/plant and seeds/capsule.

Table 2: The effect of varieties, planting dates and years on seed yield .yield components, seed yield, oil percentage and oil yield of the kenaf crop in Basrah,1998-1999

Treatment / Varieties	No. of Capsules/plant	No. seeds/capsules	1000seeds Weigh(g)	Seed yield g/m2	No. of Branches/plant	Oil Percentage%	Oil yield g/m2
Vit 11	73.0	16	26.4	315.8	3.7	6.3	20.3
Vso 1	72.5	20	25.1	408.5	3.9	6.9	29.1
Control	106.2	24	22.0	648.3	6.5	8.8	58.6
L.S.D(0.05)	20.3	2	2.6	112.8	1.9	1.3	6.9
Planting dates							
20February	84.0	14	23.3	303.9	4.5	7.2	22.2
10March	88.3	19	24.6	439.4	4.2	7.3	32.8
30March	101.9	23	26.4	638.1	6.1	8.0	57.1
20April	61.3	24	23.6	404.9	4.0	6.7	31.8
L.S.D90.05)	15.9	3	1.9	133.2	1.4	0.9	11.2
Years							
1998	79.6	19	26.1	406.1	3.9	7.5	33.2
1999	88.2	21	22.9	508.7	5.5	7.1	38.6
L.S.D(0.05)	ns	ns	2.8	86.4	ns	ns	ns

Oil percentage and oil yield:

There were a significant effects of varieties ,planting date and their interaction on oil percentage ,the control variety gave the highest oil percentage (8.8%) , while the the varieties Vit11 and Vso1 gave lower oil percentage than the control with no significant differences between them (6.3 and 6.9%, respectively) (Table 2).However ,the interaction between varieties and planting dates for oil percentage showed that the control variety tend to increase oil percentage after planting on 20 February to reach 9.5% and 9.1% when planted on 30March and 20April , respectively(Table 3).The varieties Vit11 and Vso1 reduced their oil percentage when planted late on 30March .Also planting from 20February to 30March didn't affect the oil percentage of the Vit11 and Vso1 significantly (Table 3).The reason for different planting dates affected oil percentage of the varieties may be due to the genetic back ground differences of the varieties and also may be due to the differences in seed size(1000 seed weight)result of the varieties as it was reported that smaller seed size in sunflower (Fick1978,Majid and Schneiter, 1987),safflower (Knowles,1974) and in soybean(Collins and Sedgwick.,1969)had

lower hull percentage and resulted in higher oil percentage .These findings in other crops agreed with the results in this study(Table 2and3).

There were a significant effect of varieties and their interaction with planting dates on oil yield .The control variety gave the highest oil yield (58.6 g/m^2) as main effect followed by Vso1 variety (29.1 g/m^2) while the variety Vit11 gave the lowest oil yield(20.3 g/m^2) (Table 2) .However ,the control variety gave its highest oil yield (87.5 g/m^2) and higher than other varieties when planted on 30March followed by Vso1 variety (52.1 g/m^2) ,while the variety Vit11 gave the lowest oil yield (31.7 g/m^2) when planted on the same date (Table 3). It seems that all varieties gave higher oil yield when planted on 30March but they were different in their quantity from one variety to another.

This result in oil yield would be expected since their were variation in seed yield and oil percentage between the varieties and the oil yield is the product of these variables .As it shows in Table 2 and 3 that planting on 30March gave the highest oil yield to all varieties because they gave the highest seed yield and oil percentage when planted on this date compared to other planting dates. Also the control variety produced the highest seed yield and oil percentage resulted in high oil yield compared to other varieties .Variety ×year and year×planting date and years interaction had no significant effect on oil yield.

Table3 : The effect of varieties ,planting dates and years on seed yield .yield components,seed yield, oil percentage and oil yield of the kenaf crop in Basrah,1998-1999

Treatment		No. of Capsules/plant	No. seeds/capsule	1000seeds Weigh(g)	Seed yield g/m^2	No. of Branches/plant	Oil Percentage%	Oil yield g/m2
Planting dates	Varieties							
February20	Vit 11	81.2	10	27.1	246.9	4.1	7.0	17.3
	Vso 1	85.5	15	23.3	310.6	4.3	6.7	20.9
	Control	90.3	18	19.7	354.5	5.1	8.0	28.4
10March	Vit 11	94.1	14	25.6	374.2	4.3	5.9	22.1
	Vso 1	69.8	18	27.3	420.24	3.0	7.2	30.3
	Control	94.0	24	20.9	523.8	5.3	8.8	46.0
30March	Vit 11	85.3	17	27.5	441.4	4.3	7.2	31.7
	Vso 1	95.7	23	28.1	696.9	5.8	7.5	52.1
	Control	124.9	28	23.7	921.5	8.2	9.5	87.5
20April	Vit 11	31.4	23	25.4	201.2	2.0	5.0	10.1
	Vso 1	36.9	24	21.7	214.0	2.8	6.0	12.9
	Control	115.7	28	23.8	797.5	7.2	9.1	72.4
L.S.D(0.05)		8.1	3	3.6	97.6	2.1	0.9	26.3

Table 4: The effect of variety ×interaction on number of capsules/plant,seeds/capsules and seed yield of kenaf crop in Basrah,1998-1999

Varieties	No. of Capsules/plant		No. of seeds/capsule		Seed yield g/m^2	
	Years		Years		Years	
	1998	1999	1998	1999	1998	1999
Vit 11	61.3	84.7	14	18	299.0	332.4
Vso 1	65.4	79.9	18	22	281.6	535.4
Control	112.1	100.3	25	24	637.9	658.7
L.S.D(0.05)	13.9		4.0		88.6	

CONCLUSION

In Basrah town kenaf crop use to be planted by local farmers for domestics use such as fiber, fences around their field and homes and near by the small rivers. The results in this study are important because it demonstrates that the kenaf crop could have potential for future prospect as an oil crop. This could be true if proper agriculture practices were employed .In this study it was found that agriculture practices like proper planting date, variety and soil with low salinity are important factors need to be concerned if kenaf crop needed to be planted commercially with high seed and oil yield .However ,spring planting time on 30March gave higher seed and oil yield to all varieties tested in this experiments .The local variety (designated as control) gave 921.5 g/m2 and 87.5g/m2 for seed and oil yield ,respectively(Table 3),this equivalent to 9215 kg/ha and 875 kg/ha respectively .That amount of yield were not known before and could be combative to oil crops growing in the south of Iraq. Although in this study the varieties Vit11 and Vso1 gave lower seed yield and oil percentage than the local variety, they were found superior as fiber source for paper pulp making in previous study (Majid 2003) this may indicate that breeding aim was toward paper pulp making rather oil production .Thus, this results, suggest that in front of these breeders future task for local variety improvement.

ACKNOWLEDGEMENT

The author thanks the general manager of paper industries in Basrah for his cooperation in providing the seeds and the experiment land to conduct the . Also I am indebted to Mr. Majeed Abuad the agriculture engineering at the company for looking after the experiment while my absent.

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إنتاجية محصول الجلجل (*Hibiscus cannabinus* L.) بتأثير عدة مواعيد زراعية في محافظة البصرة

٢- لغرض أنتاج الزيت والبذور

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المستخلص

لغرض تقويم إنتاجية البذور والزيت لمحصول الجلجل(***Hibiscus cannabinus* L.**)نفذت هذه التجربة خلال العامين ١٩٩٨ و١٩٩٩ لغرض تحديد تأثير ثلاثة أصناف (Vit 11 و Vso1 والسيطرة) وأربعة مواعيد زراعة (٢٠ شباط،١٠ آذار،٣٠آذار و٢٠ نيسان) على حاصل البذور ومكونات الحاصل ونسبة الزيت وحاصل الزيت .طبق تصميم القوالب الكاملة المعشاة بأربعة مكررات ،تم ترتيب المعاملات في ألواح منشقة إذ شغلت مواعيد الزراعة القطع الرئيسية والأصناف القطع الثانويةزأظهرت النتائج وجود فروقات معنوية بين الأصناف ومواعيد الزراعة وتداخلهما في حاصل البذور ,حيث أعطى الصنف السيطرة (Control) أعلى حاصل بذور (٩٢١,٥ غم/م^{٢}) عند زراعته في ٣٠ آذار ويأتي بعده الصنف Vso1 (٦٩٦,٩ غم/م^{٢}) بينما أعطى الصنف Vit11 أقل حاصل بذور (٤٤١,٤ غم/م^{٢})عندما زرع في نفس الموعد (٣٠ آذار) كما أشارت النتائج إلى أن الزراعة المبكرة والمتأخرة عن ٣٠ آذار أدت إلى تقليل حاصل البذور لجميع الأصناف .اختلافات حاصل البذور بين الأصناف كانت نتيجة اختلافات مكونات الحاصل(عدد العلب في النبات وعدد البذور في العلبة)،وأظهرت النتائج أن أنخفاض وزن ١٠٠٠ بذرة للصنف المحلي تم تعويضه من زيادة المكونات الأخرى (عدد العلب في النبات وعدد البذور في العلبة)لإعطاء حاصل عالي من البذور .الزراعة المبكرة والمتأخرة عن ٣٠ آذار أدت إلى أنخفاض مكونات حاصل البذور خاصة عدد العلب في النبات وعدد البذور في العلبة وهذا أنعكس على نتائج حاصل البذور لتكون مختلفة .أعطى الصنف المحلي أعلى نسبة زيت (٩,٥%) وأعلى حاصل زيت(٧٨,٥ غم/م^{٢}) عند زراعته في الموعد ٣٠ آذار تأخير الزراعة أدى إلى أنخفاض حاصل الزيت لجميع الأصناف بسبب أنخفاض حاصل البذور ،وأستنتج من الدراسة أن محصول الجلجل له مستقبل واعد في المنطقة بعد معرفة العمليات الزراعية الملائمة وتطبيقها .