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JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 01 Volume: 45

Published: 30.01.2017 <http://T-Science.org>

Maryam Boreshnavard

Department of Agronomy,
Islamic Azad University,
Chalous, Iran

Boreshnavard_maryam@yahoo.com

SECTION 24. Sociological research.

THE EFFECT OF CULTIVATION PATTERNS AND WEED MANAGEMENT ON KIDNEY BEAN'S YIELD AND YIELD COMPONENT

Abstract: This investigation has been designed to investigate the effects of cultivation rows intervals and weed management on kidney bean. This experience conducted in split plot randomized complete block design with 3 replications in experimental farm of Islamic Azad university of Chalous on 2015. The cultivation pattern was: 25×10 cm, 35×7 cm, 50×5 cm and 15×15 cm and weed control treatments were control (without weed management) and hand weeding (1 time). Independent and interaction effect had been surveyed in levels 1 to 5 about some traits such as shrub height, number of sheath, number of grain, sheath length, grain yield, biological yield and growth index. The effects of cultivation pattern were significant about most of mentioned traits, except shrub height. Weed management (hand weeding) had a significant effect in first level, 1% on number of sheath and biological yield. Interaction of cultivation patterns and weed management had significant effect on mentioned traits except number of sheath and shrub height. Most of yields and yield components have been observed in 15×15 cm treatment. Intensity treatment had a better effect on productivity competition with weeds.

Key words: Kidney bean, yield, yield component, cultivation pattern, weed management, biological yield.

Language: English

Citation: Boreshnavard M (2017) THE EFFECT OF CULTIVATION PATTERNS AND WEED MANAGEMENT ON KIDNEY BEAN'S YIELD AND YIELD COMPONENT. ISJ Theoretical & Applied Science, 01 (45): 139-144.

Soi: <http://s-o-i.org/1.1/TAS-01-45-27> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.01.45.27>

Introduction

Beans have key role in human nutrition after cereals, and they supply 25% of required proteins by humans. These proteins are appropriate alternative for animal proteins. United States, Brazil, Mexico and China are the great producers of kidney bean. According to statistical information, kidney bean cultivation area is 105264 Ha with 182742 Tons yield in Iran, approximately. Lorestan, Markazi, Chaharmahal va bakhtiari, Fars, Zanjan, Esfahan and East Azerbaijan are van ward provinces in kidney bean production. Cultivation area of kidney bean is 13657Ha in Markazi province with 22523 Tons (average of production) and 1649 Kg/ Ha (average of production per hectare). Khomein, Arak and Shahzand have most cultivation area in this province. According to beans features and benefits in field of human nutrition and economy, the investigation of modern method of kidney bean cultivation is one of necessary requirement for increase the average of yield for nations. Vilov research showed, considering of beans genetic diversity in middle and South

America, these locations are the main origins of bean, presumably. Ancient investigations showed, beans have 4-7 thousand antiquity before Christ evocation in Mexico, and this crop consumed by Mexican habitats in this period. Kidney bean cultivation incepted in 1542 on Europe (Bagheri et. all, 2001). Beans grain is contain of 18-32 percentage of proteins that they have key role in field of supply the human requirement to proteins (Musavi et. all, 2005) and special features of beans family, that is their capability of root coexistence with N stabilizer bacteria, has a positive effect on soil fertility in agricultural environment. Recent investigations had showed that the average amount of nitrogen will increase after harvest of beans in farm soils. Kidney bean is one of the most important member of beans family, according to that protein percentage's and other advantages, for these reasons most of cultivation area dedicated to this member (Musavi et. all, 2005). Without considering environmental detriments, the main reason for yield reduction is weeds competition in kidney beans farm (Fisk et. all,



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2002). Kidney bean is sensitive to weeds competition in commence of vegetative growth stage (Ahlawal et. all, 1981). The main purpose of weed management in this period is related to kidney bean sensitivity (Sane, 1997). According to statistical information about cultivation area inside of Iran, 94% of the main issues were weeds competition in commence vegetative growth of kidney beans (Bagheri et. all, 1998). High intensity of weeds will have different negative complications like reduction of soil fertility, lack of efficiency of herbicides and environmental detriments, due to consumption of chemical components such as herbicide. The major reasons for using herbicide is to decrease the human force, ability of obtain the minimum tillage approach and to reduce the time spending (Edward, 1980). The herbicides that are regular in kidney bean cultivation for weeds management are Chlortal dimethyl, Setocsidim, Triforalin, Ethal pheloralin and Paraquat (Bagheri et. all, 1997). Edward had many efforts in the field of reduction the weed intensity with increase the crop canopy intensity and he achieve to some successful results, he could decrease 72-98% of weed intensity, but this method was not efficient for all weeds species and this is main factor of yield reduction (Wilson, 1993). The alternative solution is repeat cultivation for weed management (Muldra & Doll, 1993). Mechanical method was disadvantage in some cases (Buhler et. all, 1995). Research in Iran shown, the hand weeding is most influence method for weed controlling about pea and lentil (Bazazi & Asghari, 2000, 2005). Another research in field of comparison of hand weeding effect and different herbicide application for weed controlling, result shown, the best time of herbicide application is soil application of Triforalin before cultivation and two step of hand weeding in commence of beans vegetative growth (Sadeghi pour& Ghafari, 2002) .

Methodology

This trial had been done in experimental farm of Islamic Azad University of Chalous on 2015. Location height is 5.11 meter from free seas surface and geographic length is 53°11" (East) and geographic wide is 36°37" (North). This investigation conducted in split plot randomized complete block design with 3 replications.

Main factor: D₁ without hand weeding D₂ Hand weeding
Subsidiary factor: I₁ 50×5 I₂ 35×7 I₃ 25×10 I₄ 15×15

The plot length was 4 m with 3 m wide, and 3 replications. Rows distances were 50, 55, 25 and 15cm and shrubs distance (on the rows) were 5, 7, 10 and 15 cm and plots distance was 50 cm. The total area of cultivation was 500 m². Kidney beans grain cultivated with hand and cover with soft soil, after soil tillage and fertilizing. Grains drenched, 24 hours before cultivation. The first irrigation had been done after one week, and it continued with 7 days interval, according to the shrub requirement and soil condition. After one month, most of shrubs incepted the flowering (sheath preparation), during this stage the researcher have used methaldehyde for snail population control. Furthermore, the researcher used the guardant to fix and stand the subsidiary branches. Guardant is very important to proceed the hand seeding operation and prevention of soil diseases dispersion. Hand weeding had been done during vegetative growth stage. Harvest operation done after two months, and this operation commence from middle plot for extirpate the marginal effects. To determine the wet weight and dry weight, necessary factors separated and measured in lab antiseptic. Sampling had been done in days 31 for determination of yield and yield component. Sampling was done with extirpate the marginal effect with line systemic trend. During sampling, 3 shrubs selected and cut from crown and after sticker issue for next operation, transmitted to lab. The samples took on packets in dry condition for 12 hours before the next measurements. Traits had been measured with grain maturation in the same time.

Morphological Traits

After physiological maturation, samples were selected from middle of rows with remove the marginal effects. Shrub height, sheath grain, number of sheath, 100 grain weight and harvest index. Economical yield, biological yield and harvest index had been measured after final harvest. Data analysis had been done with SAS software; the researcher also used MSTATC software for average comparison and variance analysis in level 1%. What's more the researcher used Microsoft office excels for charts design.

Table 1
Simple average comparison analysis of hand weeding and cultivation pattern of kidney bean's yield component

traits/ treatment	Shrub height	No. of sheath in shrub	No. of grain in sheath	sheath length	grain yield	biological yield	harvest index
50*5cm	112.1b	15.7a	32.85a	9.3b	10520b	443.3c	26.78a

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35*7cm	116.2ab	9.2c	30.52ab	9.7a	11410b	471.5bc	27.13a
25*10cm	108.5b	11.1b	26.02b	9.3b	5367c	500.8b	9.71c
15*15cm	129.8a	12.5b	33.68a	9.9a	17580a	674.2a	17.7b
without hand weeding	145.9a	11.6a	30.5a	9.5a	13598a	481.5b	22.37a
hand weeding	87.3b	12.7a	30.9a	9.6a	8845b	563.3a	18.29b

*Same signs in column and treatments, shows there is no significant variety in level 5% according to Doncan test

Table 2

Interaction of average comparison analysis of hand weeding and cultivation pattern treatments of kidney bean's yield component

Traits/ Treatment	Shrub height	No. of sheath in shrub	No. of grain in sheath	sheath length	grain yield	biological yield	harvest index	
50*5cm	Without	150.3ab	12.7b	43.97a	10ab	16440a	436.7c	33.93a
35*7cm	hand weeding	131b	9.1d	31.83b	9.7abc	14150a	513b	28.83ab
25*10cm		140.7ab	12.6b	26.4bcd	9.1bc	4902c	446.7c	9.63e
15*15cm		161.7a	12.1bc	20.07d	9.5abc	18900a	530b	17.10de
50*5cm	Hand weeding	73.8d	18.7a	21.73cd	8.6c	4609c	450c	19.63cd
35*7cm		101.3c	9.3d	29.2bc	9.8abc	8675bc	430c	25.43bc
25*10cm		76.3d	9.7cd	25.6bcd	9.7abc	5832c	555b	9.8e
15*15cm		97.8c	13.1b	47.3a	10.4a	16260a	818.3a	18.3cd

*Same signs in column and treatments, shows there is no significant variety in level 5% according to Doncan test

Result and discussion

Shrub height

The effect of cultivation pattern (rows distance) and weed management (hand weeding) on shrub height were significant in level 5%. Furthermore, most amount of shrub height has been observed in 15×15 cm treatment. The average of shrub height had 40% increases with weed management. The increment of shrub height occurs when intensity increased, this event related to decrease the sunlight influence to bottom layers. (Ninhois & Sink, 1985) approved the bean variety with unlimited growth, show increment of shrub height with increase the intensity. Interaction of cultivation pattern and weed management on shrub height was significant in level 5%. Indeed, Shrub height had considerable reduction in all of the integrated cultivation patterns and weed management treatments. Least shrub height observed in 5×50cm treatment. This event is justifiable, kidney bean height decreased due to reduction of sunlight reception and absorption of mineral nutrients.

Number of sheath in shrub

The effect of cultivation pattern (rows distance) on number of sheath in shrub, was significant in level 1%, but effect of weed management (hand weeding) was not significant in same level. Furthermore, most number of sheath in shrub, observed in 5×50cm treatment. Number of flowers and their inoculation decreased in high intensity condition and it is related to increase the species competition for reception of

sunlight and mineral nutrient absorption, presumably. Although, the plants will not have appropriate growth and sunlight quality, and it is related to inadequate mineral nutrients and average of sunlight. In this situation number of subsidiary branches will decrease. In result, number of sheath in shrubs will decrease. Increment of sheath in low intensity is related to their numbers in subsidiary branches. Interaction of cultivation pattern and weed management was significant in level 1%. The most number of sheath observed in 5*50cm with weed management, meanwhile the least number of sheath observed in 7×35cm treatment. In this investigation, number of sheath affected by weed competition, the same results reported by (Malik et. all, 1993), (Bayat, 1998) and (Deri welk, 2001).

Number of grain in sheath

The effect of cultivation pattern (rows distance) on number of grain in sheath, was significant in level 5%, but effect of weed management (hand weeding) was not significant in same level. The most number of grain in sheath observed in 5×50cm treatment. Interaction of cultivation pattern and weed management on number of grain in sheath was significant in level 1%. In addition, most number of grain in sheath observed in 15×15cm treatment with hand weeding. Meanwhile, least amount of grain in sheath observed in 15×15cm treatment without hand weeding. The same results reported by (Malik et. all, 1993), (Bayat, 1998).

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Length of sheath

The effect of cultivation pattern (rows distance) on Length of sheath, was significant in level 5%, but effect of weed management (hand weeding) was not significant in same level. Interaction of cultivation pattern and weed management on Length of sheath was significant in level 5%. The most Length of sheath observed in 15×15cm treatment with hand weeding. Although, the least amount of Length of sheath observed in 5×50 cm treatment with hand weeding. Indeed, we observed ascend trend of Length of sheath in cultivation pattern and weed management in square models compare to rectangular models.

Grain yield

The effect of cultivation pattern and weed management on Grain yield was significant in level 1%. Interaction of cultivation pattern and weed management on Grain yield was significant in level 5%. The most Grain yields were observed in 15×15cm treatment without hand weeding. Also the least amount of Grain yield observed in 10×25cm treatment without hand weeding. Indeed, increment of intensity and integrated cultivation pattern and weed management with square style, is more efficient rather than other treatments on kidney bean yield. (Kuzmen et. all, 1979) reported, the low distance of rows and integrated cultivation pattern had the most yields compare to another patterns. Square style of cultivation with minimum inter specie competition recommended for achieve to most productivity. According to (Doss et. all, 1995) investigations result on row distance of bean, they confirmed the narrower row distance will have more yield compare to wide row distance. (Sundon & et. all (1995) approved the increment of bean intensity

to 40 from 10 per m² or decreasing the row distances have more efficiency in the result of spatial and ground species of beans family. (Raden & et. all (1987) reported improvment of bean intensity to 33 from 11 per m², showed 16% increase in bean yield.

Conclusion

Furthermore, assessment of interaction of cultivation pattern and weed management (hand weeding), required more investigation for access to supplementary information about the effect of integrated weed management approach (mechanical and chemical control of weeds) on beans family yield. According to investigation result about hand weeding and the usage of different herbicide for weed controlling, the best timing for application of herbicide (Triforalin) is before cultivation of kidney bean and obtain two steps of hand weeding during vegetative growth stage with appropriate interval (Sadeghi pour, 2007).

Recommendations

- Having a survey to investigate the effect of hand weeding and cultivation pattern on yield, which is required a study of integrated weed management approach
- Assessment of herbicide application timing (pre cultivation and post cultivation) with obtaining the various cultivation style
- Design same investigation in different climates with various soil condition and weed species diversity
- Having a survey about other bean families performance in the same condition which has been used in this study

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