AENSI Journals

Advances in Environmental Biology

ISSN-1995-0756 EISSN-1998-1066

Journal home page: http://www.aensiweb.com/AEB/

Investigating the Effect of Planting Rows Spaces and Weeds Management Way on Quantity Indexes and Seed Yield of Pea

[1]Negar Ashori, [2]Morteza Sam Daliri, [3]Amir Abbas Mousavi

[1]Department of Agronomy and Plant Breeding, College of Agriculture, Chaloos Branch, Islamic Azad University, Chaloos, Iran.
[2]Associate Professor, Department of Agronomy and Plant Breeding, College of Agriculture, Chaloos Branch, Islamic Azad University, Chaloos, Iran.
[3]Assistant Professor, Department of Agronomy and Plant Breeding, College of Agriculture, Chaloos Branch, Islamic Azad University, Chaloos, Iran.

ARTICLE INFO

Article history:
Received 21 November 2014
Received in revised form 4 December 2014
Accepted 3 January 2015
Available online 28 January 2015

Keywords:
pea, weeds management ,planting pattern, herbicide

ABSTRACT

In order to study the spaces between planting pattern on pea yield and yield component, an experiment was performed as factorial experiment with three replications in the format of completely randomized block design in experimental farm of Chalous Azad university in2013.the factors were included, planting pattern on three levels of 15cm×50cm, 20cm×50cm and 30cm×50cm and weed management was studied in four levels including, without control, once weeding, twice weeding, application of pre-emergent herbicide of treflan. Results showed that increasing bushes spaces lead to increasing the plant height, seed number per bush and decreasing the pod yield. Square pattern of planting, resulted in increasing in seed yield in bush and decreasing space led to increasing subsidiary branches. But it wasn't achieved significant results about main branches and also, herbicide application led to decreasing plant height. Finally, the maximum amount of pea yield was achieved by planting pattern of 15×50cm with two step of weeding in relation to the other ways, since in addition to remove or decreasing interfering of weeds, by management and weeding treatments, seed yield was increased in higher density due to increasing the number of bush per plant.

To Cite This Article: Negar Ashori, Morteza Sam Daliri, Amir Abbas Mousavi., Investigating the Effect of Planting Rows Spaces and Weeds Management Way on Quantity Indexes and Seed Yield of Pea. ***Adv. Environ. Biol., 9(2),*** *1324-1329, 2015*

INTRODUCTION

Pea (Pisum sativum) of genus cicer, from Leguminosae family and Fabacea subfamily[3]. The pea has second rank between leguminosaes and it is in 15th rank between general crops of the world. Its quality and quantity is depended on planting, maintenance and harvest way like other crops. Spatial distribution of plants or in the other word, planting pattern, (adjusting rows spaces and plant space on a row) in an agronomy population in relation with light radiation and this traits has a deterministic role in photosynthesis potential and yield since, the growth rate is a function of the using radiation energy in photosynthesis. Shibelse & Weber believed that the maximum yield riches when the rows space is closer to square planting pattern. Whereas whilcox, didn't observe any clear difference between different patterns of planting on soybean yield. Other researches indicated that much monotonous distribution per area unit is along with more photosynthesis and higher yield is achieved. Bookat, reported that increasing the plant height with increased density is due to increasing competition for light in high density. Bush density, is effective on root system, plant height, number of tiller, plant lodging, incidence of diseases and fertilization [10]. The yield of every crop plant is resulted from intra spices competition (between different bushes) and intra bushes (between different organs of one bush with each other) for environmental factors (light, soil nutrition ,etc) and the maximum yield of seeds per area unit is achieved when these competitions come in to the least and the plant can makes the maximum use of growth factors. The planting region effect is Important too and with exact investigation in any region it could be determined the suitable planting pattern for different row plants on the other hand, weeds are the main limiting factors of crops production that are competing with crops for sources such as, humidity, nutritious and space [15] and influence increasing production and easiness of harvest considerably by weeds interfering. Weed spices that are

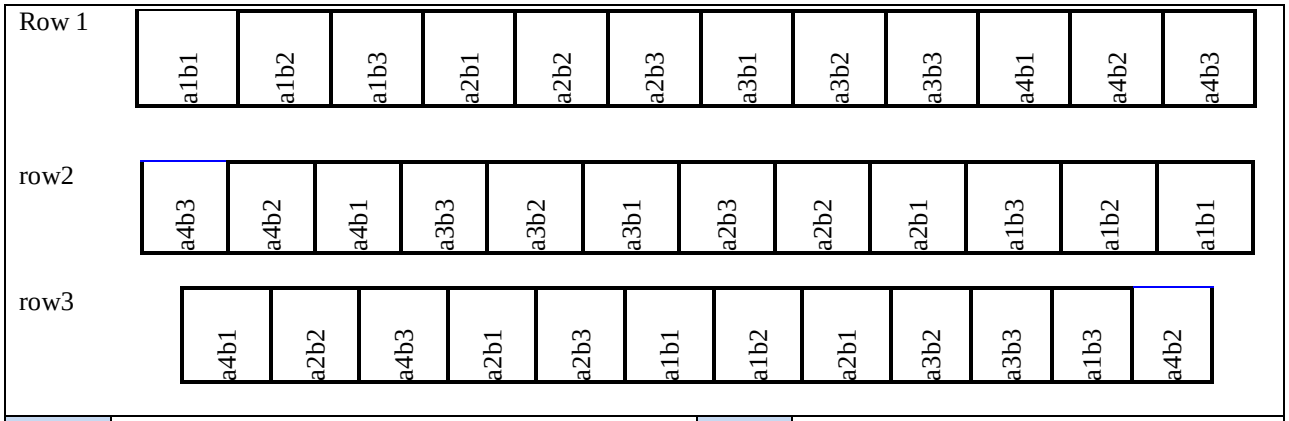
Corresponding Author: Negar Ashori, Department of Agronomy and Plant Breeding, College of Agriculture, Chaloos Branch, Islamic Azad University, Chaloos, Iran.

competitor of peas are various depend on soil type, degree of heat, latitude, sea surface height, irrigation management, fertilization management and technology. Through studies that was performed from 2000 to 2005, it was observed that broad-leaved weeds like knot grass, Brome chess, caltrops, stearea viridis(L), are the main competitors in pea production[14]. For control and management of weed, it is suggested different ways such as, mulching, soil fumigation, soil solariation, mechanical and chemical control. Choice The best way in control of an agronomy crop or crop garden weeds is related on Local experiences, mankind forces existing, machinery possibilities and means and existing of various herbicides. In this research, it was attempted, in addition to determining the effect of planting pattern, the effect of weeding and pre- emergent herbicide treflan on pea crop yield be investigated.

MATERIAL AND METHOD

This design was performed in research farm of Chalous Azad university agriculture faculty with longitude of 36 degrees 37 minutes on northern side. Experiment place is placed at 11.5 meters-height from sea surface. This experiment was performed as split plot design with the base of completely randomized block design with three replications. This design was consisted of 36 plots in three replications that length of every plot was 3 meters and width of every plot was 3 meters. The main factor was management way of weeds in 4 levels and subsidiary factor were consisting planting spaces on row in three levels(15,20 and 30 centimeters),with row space of 50 centimeters(figure 1).

In order to performing design, at first, preparation operations including plough, leveling and trowel were performed. Plots were created according to the design and corresponded plots were sprayed by pre-emergent herbicide trflan with popular name of floralin (α,α,α-thtee floro-2,6-di nitro- n,n- di propel p- toloiden). After some times about 3 weeks seeds were planted. Planting lines was prepared manually with plough and after that seeds ware placed in 3-5 centimeters depth in furrow without emergency. To make more confidence coefficient for emergency, the farm was irrigated after planting. Using seeds with 98% germination potential and 100% purity, were provided from reliable centers and were used. In order to performing the treatments of once weeding and twice weeding, weeds control was performed with hand. The weeds were including, one year-weeds such as camomille, Purslane, Cypress vine (Star glory),Safflower and Perennial Weeds like Liquorice and Bermuda grass Harvesting time of pea is when pods become completely yellow and dry, humidity reaches to 14 percent. After removing the border and all lines of every plot with removing 0.5 meter from beginning and the end of both lines, harvesting was performed from an area of 1 square meter.



a1	without control treatment to weed control	b1	planting space of 15×50 cm
a2	once weeding treatment to weed control	b2	planting space of 20×50 cm
a3	twice weeding treatment to weed control	b3	planting space of 20×50 cm
a4	herbicide treatment to weed control		

Fig. 1: Experimental design and treatments introduction.

Achieved information about crop and plant bush was investigated statistically. In order to analyzing of variation of data, the MSTATC software was performed and mean comparison of treatment was performed by Dancan's multi-side test at probability level of 5 %. Results has been offered in (table 1)(table2)(table 3).

Table 1: Mean square results of weeding treatment and planting pattern effect on pea's yield components analyzing of variance.

Source of variation	Degree of freedom	Plant height	Seed number per bush	Empty pod number per bush	Seed yield per bush	Pod yield	Subsidiary branches number	Main branches number
Repeats	2	416.595	0.298	0.176	3.679	62.507	5.021	0.374
Weed management	3	12.334ns	136.209**	0.192*	238.454**	70920.762**	87.523**	0.205ns
Planting pattern	2	14.348ns	646.199**	0.176*	74.89*	6760.679**	8.05ns	0.075ns
management pattern×	6	53.904*	326.439**	0.191*	112.05**	16047.696**	7.548*	0.128ns
Error	22	21.268	26.218	0.049	16.768	169.283	4.114	0.164
Coefficient of variation		6.73	12.98	15.52	16.86	9.42	16.51	14.19
explanation		* and ** are indicating significant at 5 and 1 percent level respectively						

Table 2: Simple effect mean comparison of weeding and planting pattern treatments on pea's yield components.

Characteristic / treatment	Plant height	Seed number per bush	Empty pod number per bush	Seed yield per bush	Pod yield	Subsidiary branches number	Main branches number
Without weeding	69.48a	45.05a	0.355a	20.74c	79.14c	11.38b	1.35a
Once weeding	67.08a	36.13b	0.111b	20.06c	66.48c	8.71c	1.24a
Twice weeding	69.52a	38.71b	0.0333b	31.24a	260.4a	16.19a	1.14a
Herbicide application	68.18a	37.86b	0.0666b	25.1b	146.4b	12.87b	1a
15 centimeters	67.36a	32.65c	0.1333ab	22.38b	164.9a	13.16a	1.1a
20 centimeters	68.84a	38.43b	0.266a	23.37b	119.6b	12.17a	1.26a
30 centimeters	69.49a	47.23a	0.025b	27.11a	130b	11.53a	1.18a
explanation	The common letter or letters in any row or column expressing non significant difference at 5 percent level based on Dancan's test. Row spacing is equal and 50 centimeters in all treatments in this research						

Table 3: Reciprocal effect mean comparison of weeding and planting pattern on pea's yield component.

Planting-maintenance		characteristic						
Weed management	Planting pattern	Plant height	Seed number per bush	Empty pod number per bush	Seed yield per bush	Pod yield	Subsidiary branches number	Main branches number
Without weeding	15	70.83abc	27.89de	0.2b	14.54f	131.7d	11.63bc	1.43a
	20	68.97abc	48.89b	0.866a	15.22ef	40.8f	12.3b	1.43a
	30	68.63abc	58.37a	0b	32.47a	64.9ef	10.3bc	1.2a
1 weeding	15	65.53abc	46.22b	0.333b	18.7def	53.9f	8.5bc	1a
	20	71.83abc	27.67de	0b	22.11bcdef	83.1e	7.86c	1.2a
	30	63.87bc	34.51cde	0b	19.37cdef	62.4ef	9.76bc	1.53a
2 weeding	15	70.1abc	31.16de	0b	26.7abc	283.5a	16.53a	1a
	20	65.07abc	36.06cd	0.1b	33.62a	219.5c	16.3a	1.43a
	30	73.4a	48.92b	0b	33.4a	243.3c	15.7a	1a

herbicide	15	62.97c	25.35e	0b	29.56ab	255.3b	15.9a	1a
	20	69.5abc	41.11bc	0.1b	22.53bcde	134.8d	12.3b	1a
	30	72.1ab	47.11b	0.1b	23.21bcd	49.23f	10.3bc	1a
notice	The common letter or letters in any row or column expressing non significant difference at 5 percent level based on Dancan's test. Row spacing is equal and 50 centimeters in all treatments in this research							

Plant height:

Analyzing of variance results indicated that planting pattern effect and weed management ways on plant height wasn't significant (tables 1 and 2). But it was significant at 5 percent level(table1), such that in applying herbicide treatment, with increasing plant spice, plant height was increased considerably(table 1) and the least plant height was observed in planting pattern of 15 ×50 cm with herbicide application(table3).

Based on Yousefi et al reports, the minimum bush height in herbicide treatment is probably due to much damaging of meristem point, that has been exposed to this herbicide through passing soil layers and also washing herbicide from soil surface via irrigation and rain, and then root contacting with herbicide that cause to disorder in normal development of root and nutrition absorption and transferring by this organ to the shoot parts, lead to decrease height.

Seed number per bush:

Analyzing of variance results showed that planting pattern and weed management ways effect, is significant on seed number per bush at probability level of 1 percent(table 1). Such that, with increasing bush planting space, the number of seed per bush has been increased(table 2). Increase of bushes space has considerable effect on increasing the seed number per bush. Because of increasing competition between bushes intra row to achieve water, nutrition, light receipt and weed interfering problem inter planting rows, the investigating trait mean decreased.

Reciprocal effect of planting pattern and wed management(weeding), on seed number per bush became significant at probability level of 1 percent(table1) and (table 3).such that in management treatment of control, twice weeding and herbicide application, with increasing bush space, seed number per bush is increased, that its reason could be found in decreasing the competition of bushes intra row and decreasing the competition of weeds with the pea inter planting rows, therefore increasing pod number per bush and finally increasing seed number per bush.

Number of empty pod per plant:

Analyzing of variance results showed that, planting pattern and weed management ways was significant on empty pod number at probability level of 5 percent (table 1), such that, the most number of pods was observed in planting pattern of 20 × 50 centimeters(table 2).By management treatment of without weeding, the available space of plant is increased, it seemed that competition between plants to absorb nutrition, humidity and sufficient light is increased that was resulted to increasing empty pod number of plant. Mohammad nezhad *et al*, expressed increasing of unfertile pods and therefore decreasing the suitable space of plants and photosynthesis material limitation [13,12].

Reciprocal effect of planting pattern and weed management (weeding) on empty pod number became significant at 5 percent probability level(table 1). Such that, the moist number of empty pod per plant was observed in management treatment of without weeding and planting pattern of 20 ×50 centimeters(table 30that is because of less interfering of weed with pea.

Seed yield of pea:

Analyzing of variance results showed that planting pattern and weed management ways effect on seed yield per bush was significant at probability levels of 5 and 1 percent respectively(table 1), such that, with increasing bush planting space , seed yield per bush has been increased(table 2)with increasing plant space, the planting pattern is going to the square planting that was resulted in decreasing the weed interference , decreasing the competition between bushes and weed, increasing leaf area index, increasing the absorption of sun radiation, increasing the assimilation of dry matter per seed and finally, increasing seed yield. These results were according to the results gathered by Buhring and Harison [11], Tesdal, [10], Johnson *et al* [9], Johnson *et al* [8], Shrestha *et al* [7], Finck [6], Gardiol [5], Holshouser and Whittaker [4].

Reciprocal effect of planting pattern and weed management (weeding), on seed yield per bush became significant at probability level of 1 percent (table 1)(table 3). Such that in management treatment of control, and two weeding steps, with increasing bush space, seed yield per plant is increased that its reason could be found in decreasing of bushes competition on one row(intra row) and weed with the pea between planting row(inter row) and then increase of seed yield per plant.

Pod yield:

Analyzing of variance results showed that planting pattern and weed management ways effect on pod yield was significant at probability levels of 1 percent (table 1).Such that, with increasing planting space the pod yield has been decreased and the maximum yield of pod was observed in management treatment of two weeding steps(table 2). There is significant difference between reciprocal effect of planting pattern and management ways about pod yield mean, at probability level of 1 percent(table 1), such that the most yield of pod was observed in two step weeding management treatment and planting pattern of 15×50 centimeters(table 3). It seems that pod yield in higher densities was increased due to increasing bush number per area unit [3]. In this study, weed management importance was determined by performing two steps of weeding in order to increasing the pod yield of the pea.

Number of main and subsidiary branches:

Analyzing of variance results showed that planting pattern and weed management ways effect on number of the main and subsidiary branches wasn't significant(table 1)(table 2). Reciprocal effect of planting pattern and weed management (weeding) became non significant at probability level of 5 percent(table 1)(table 2)(table 3). The similar result was achieved by Akbari too. Analyzing of variance results showed that the planting pattern effect wasn't significant on subsidiary branches number, but weed management ways on subsidiary branches number was significant at probability level of 1 percent(table1), Such that the most number of subsidiary branches ,has been observed in two steps weeding management treatment (table 2).With management treatment of two steps weeding, the available space of plant is increased and it seems that the competition between plant for absorption of nutrition, humidity and sufficient light by bushes became less and finally caused to increasing the number of subsidiary branches per bush. Similar results had been reported also by Azari and Khajepour (2/5) and Johnson and Hanson(2003). Reciprocal effect of planting pattern and weed management (weeding) on subsidiary branches number wasn't significant.

Conclusion:

Independent and reciprocal effect of planting pattern (space and row) and weed management was investigated on pea characteristics such as plant height, number of the main and subsidiary branches, empty pod number of bush, seed number per bush, pod yield, at probability levels of 1 and 5 percent. Planting pattern effect became significant on all of these traits except, plant height, number of the main and subsidiary branches. Weed management treatment effect was significant on all of these traits except plant height and number of the main branches. Reciprocal effect of planting pattern and weed management was significant on all of these traits except number of the main branches.

Results of this study, indicates that management treatment of two steps weeding has been provided the ground to increasing yield and yield components of crop and decreasing the weed population. However, weeding management isn't possible in huge farm due to time consuming, high expenditure of labor and inappropriate environmental condition (specially in rainy season). In such circumstances, herbicide application is recommended that positive effect of them has been observed in decreasing weed interference with some traits of the pea. The most amount of pea yield was achieved by planting pattern of 15×150 cm with two steps of weeding, in relation to the other methods of planting since in addition to remove or decreasing the weed interference by management treatment of two weeding steps, seed yield in higher densities was increased because of increasing bush number per area unit.

REFERENCES

[1] Ahmadi, A., 2003. Determining critical period of weed control and investigating different periods of competition on morphological traits And yield of the bean. M.Sc Thesis of identification and control of weeds. Mashhad Ferdosi University.

[2] Azari, A. and M. Khajehpour, 2006. The effect of planting pattern on development, growth, yield component and yields of the seed and petal in summer planting of safflowrr, Isfahan shark local mass. Journal of agricultural and natural science technology and science. Volume 35th . number of 3. Pages 131-141.

[3] Bagheri, A.R., A.A. Mahmoudi and Y. Naseh, 1997. History, origin and botany. Parsa, M. and A.R. Bagheri. Beans(grains). Publication of Mashhad university jihad. Page 522.

[4] Buehring, N.W. and M.P. Harison, 2002. Corn response to twin and narrow rows with selected seeding rate. weed sci., 18: 30-33.

[5] Finck, C., 2003. Twin rows take to field. Farm J. (Midwest/center edition). philadelphia,127: 8-15.

[6] Gardiol, J.M., L.A. Serio and A.I. Della Maggiora, 2003. Modelling Evapotranshipiration of corn (zea mavs) under different plant densities. J. of Hydrology, 271: 188-196.

[7] Garden, F.P. and E.Q. Auma, 1989. Canopy structure, light interception and yield market.

[8] Holshouser, D.L. and J.P. Whittaker, 2002. Plant population and row spacing effect on early soybean production system in mide-Agronomy J., 30: 222-227.
[9] Jentter, R.J., K.H.M. Siddique, S.P. Loss and R.J. French, 1999. Optimum plant density of Desi chickpea increases with increasing yield potential in southweastern Australia. Auast. J. Agric.
[10] Johnson, B.L. and B.K. Hanson, 2003. Row-spacing interaction on spring canola performance in the Northern Great Plains. Agron J., 95: 703-708.
[11] Johnson, G. and T.R. Hoverstad, 2002. Effect of row spacing and herbicide application timing on weed control and grain yield in corn (Zea mays). Weed Technol., 16: 548-553.
[12] Johnson, W.G., J.A. Kending, R.E. Massey, M.S. Defelice and C.D. Becker, 1997. Weed control and economic returns with postemergence herbicide in narrow-row soybean. Weed Tecnol., 11: 443-450.
[13] Liu, P.H., Y. Gan, T. Warkentin and Mc Dinald, 2003. Morphological plasticity of chickpea in a semiarid environment crop sci., 43: 426-429.
[14] Miont, N. and D. Williston, 2006. Weed control and desiccation strateyies in chickpea.app 17.
[15] Regan, K.L., K.H.M. Siddiqe and L.D. Martin, 2003. Response of kabuli chikpes (Cicer arietinum L.) to sowing rate in meditranean type environments of south western Australia. Aus. J. Exp. Agric., 43(1): 84-97.
[16] Shrestha, A., I. Rahcan, K. Chandler and J. Swanton, 2001. An integrated management strategy for glufisonate-resistan com(zea mays). Weed Technol., 15: 517-522.
[17] Teasdal, J.r., 1998. Influence of corn (Zea Mays) Population and row spacing on corn and velvetleaf (Abutiolontheophrasti) yield. Weed Sci., 46: 447-453.