International Journal of Environmental Sciences & Natural Resources
ISSN: 2572-1119

Research Article
Volume 4 Issue 3 - July 2017
DIO : 10.19080/IJESNR.2017.03.555640

Int J Environ Sci Nat Res

Effect of Plant Spacing On Quantitative and Qualitative Characteristics of Fcv Tobacco Hybrids

Hazrat Usman[1]*, Abdul Qahar[1], Nabeela Bano[2], Mushtaq Ahmad[3], Muhammad Owais Iqbal[1], Masood Shah[4], Shaukat Ali[4], Muhammad Zeeshan[4] and Faheem Ahmad[4]

[1]*Department of Agronomy, The University of Agriculture, Pakistan*

[2]*Tobacco Research Station, Khan Garhi, Mardan*

[3]*Department of Plant protection, The University of Agriculture, Pakistan*

[4]*Department of Soil & Environmental Sciences, The University of Agriculture, Pakistan*

Submission: August 20, 2017; **Published:** August 31, 2017

***Corresponding author:** Department of Agronomy, The University of Agriculture, Peshawar, Pakistan; Email: hazratusman@aup.edu.pk

Abstract

A field experiment was carried out on "effect of plant spacing on quantitative and qualitative characteristics of FCV tobacco hybrids" at The Tobacco Research Station, Khan Garhi, Mardan during 2014-2015, using randomized complete block design with split plot arrangement, replicated thrice. Treatments included three tobacco hybrids (CSC 4302, CSC 4704 and CSC 447) and three plant spacing (T1=R-R 120 cm and P-P 55 cm, T_2= R-R 107 cm and P-P 55cm and T3=R-R 90cm and P-P 60cm). Plant height, leaf area were significantly affected by tobacco hybrids and cured leaf yield (kg ha 1) were significantly affected by spatial. Higher plant height (114.7cm) from CSC hybrid 4302, leaf area (1142cm^2) from CSC hybrid 4704 and higher cured leaf yield (3842 kg ha^{-1}) were recorded from CSC hybrid 447 tobacco hybrids. Higher plant height (107.3 cm) and higher cured leaf yield (4109.7 kg h a^{-1}) were recorded from spatial arrangement T_3. It is due to the space for tobacco hybrids are better and the variety CSC-447 performed better. Hence spacing T_3 and CSC-447 hybrid is recommended for better growth and higher yield of tobacco crop in Mardan region.

Keywords: Plant Spacing; FCV Hybrids; Tobacco yield; Tobacco Leaf Quality

Introduction

Tobacco is grown for leaf purpose and widely grown as non-food commercial plant in the world. Tobacco is also one of the major cash crops in Pakistan especially in Khyber Pakhtunkhwa. Tobacco is the only crop in Pakistan whose yield on per unit area is compare with developed countries like USA. However there is struggle for improvement in yield on per unit area Ahmed [1] Tobacco is cultivated in Pakistan on 50,000 hectares with a total leaf production of 108,000 tons. Tobacco has become an important cash crop of Khyber Pakhtunkhwa the agro climatic conditions are extremely suitable for its cultivation. Total area under cultivation in Khyber Pakhtunkhwa is 30,048 ha, which produce 100.78 million kg Pakistan Bureau Statistics [2] Tobacco contributes 4.4% to the GDP of Pakistan. Its export value was 570.2 million rupees which share in all export of Pakistan. Cigarettes and tobacco give 30.6 billion rupee indirect taxes whose share in gross are 5.4% Federal Board of Revenue, 2008. Among growing practices, plant spacing can affect agronomic and chemical traits of Tobacco Alizadeh [3] several researchers recoded high yield on maximum plant densities. However, quality of such leaves was usually lower due to decreased nicotine content Chaplin [4], Campbell [5]

Higher plant density in tobacco produce taller plants with smaller leaves, but also effect on number of leaves per plant. Closer spacing tobacco result in higher yields, increased crop returns Kozunrttx and Lurosrvrcrus., 1975. Plant spacing is required for the optimum yield. Closer spacing of plants resulted in reduction of size, body, thickness and weight per unit area of the leaf, Price of tobacco grown at higher plant densities was also lower, resulting in lower income from such production observed a decrease in total leaf area per plant with increased plant population Bukan [6] Regulate the optimal density is one of the important factors to get the maximum yield due to the climatic conditions of each region and specifications of varieties are cultivated.

The purpose is to determine the optimal density; spacing between plants, so that an appropriate combination of environmental factors provided to achieve maximum performance with possible quality. In considering an appropriate density, mutual ghosting is minimized and light thus photosynthesis is maximized. If the planting spaces are too common, certainly the number of plants per unit area reduced

and the yield will be faced with a deficit. Due to the efficiency of water use in the product increase, desirable high density is needed to achieve a high performance Kharazmi [7].

Materials and Methods

Experimental site

Tobacco research station is located in the south west of the district Mardan at 34°12'0N 72°16'0E, altitude of 283 meters (928 feet), and with an elevation of 314 meters above sea level.

Experimental design

The experiment was laid out in RCB design with split plot arrangement, having three tobacco varieties (Main plot) and treatment (sub plot), replicated thrice at the Tobacco Research Station, Khan Garhi, Mardan, during 2014-15. Spatial arrangement was done 120x55cm, 107x55cm and 90x60cm row to row and plant to plant distances respectively.

Nursery management

Nursery was raised on 20th December 2014. Seed rate of 4g ha^{-1} was used. Bed size will be 10m2. Thinning was done to get optimum and healthy plant stand. Three tobacco hybrids of CSC series i.e. CSC 4302, CSC 447, CSC 4704 were sown.

Field preparation

Before transplantation, land preparation was done using primary and secondary tillage implements. Good and viable seedlings were transplanted in the field and the field was irrigated to establish good root system.

Transplantation

Transplantation was done during the last week of March 2015. Each plot and subplot having five rows, having 10 plants in each row. The row to row distance was 3, 3.5 and 4 feet, while plant to plant distance was 2, 1.8 and 1.8 feet respectively.

Field management

After transplantation irrigation were applied 6-7 times. N:P:K fertilizers were applied with the rate 75:75:75 kg ha^{-1}. After transplantation one dose was applied to the two sides of plants. Topping was done at 24 leaves stage. The parameters studied were plant height, leaf area $plant^{-1}$, green leaves weight $plot^{-1}$ (kg), number of green leaves kg^{-1}, cured leaves weight $plot^{-1}$(kg), number of cured leaves kg^{-1}, cured leaf yield ha^{-1}, nicotine and reducing sugar contents, using the following procedure.

Plant height (cm)

In each plot thirty plants were selected and measured from top to bottom and their mean was calculated.

Leaf area (cm^2)

For leaf area, thirty plants randomly were taken then leaf length and breadth was measured. The average leaf size was computed from these plants by multiplying with a common factor of 0.644 derived by Suggs et al. 1960.

Leaf area = Leaf length x leaf breadth x 0.644 2.

Number of green leaves kg^{-1}

The number of green leaves was found by measuring the number of green leaves in each bundle of plot.

Number of green leaves kg^{-1} = No of leaves in the determined weight x kg

Green weight determined

Number of cured leaves kg^{-1}

The number of cured leaves was found by measuring the number of cured leaves in each bundle plot.

Number of cured leaves kg^{-1} = No of leaves in the determined weight x kg

Cured weight determined

Cured leaf yield (kg ha^{-1})

Data concerning leaf yield, the weight of cured leaf in each treatment was taken after each picking. The total cured leaf yield was calculated by the following formula:

Yield (kg ha^{-1}) = Cured leaf weight $plot^{-1}$ x total no. of plants ha^{-1}

No. of leaves per plot

Nicotine Content (%)

Nicotine was determined by the method of Cundif and Markunas 1964. The nicotine contents were calculated by the following formula:

Nicotine (%) = V1 x N x 32.45 x 100

Weight of sample

Whereas

V1=Volume of titrant for non-acetylated aliquote.

N=Normality of perchloric acid.

4.13. Reducing Sugars (%)

Reducing sugars percentage was estimated as follow:

Reducing sugars = 25 x 100 x 0.05

Titrate x wt. of sample

Data collected was analyzed according to split plot design and means were compared using least significant difference (LSD) test Steel and Torrie 1980

Results and Discussion

Plant height (cm)

Data regarding plant height of tobacco hybrids indicated that different tobacco hybrids had significant effect on plant height of different tobacco hybrids (Table 1). Taller plants (114.7) were

How to cite this article: Hazrat U, Abdul Q, Nabeela B, Mushtaq A, Muhammad Owais I, et al. Effect of Plant Spacing On Quantitative and Qualitative Characteristics of Fcv Tobacco Hybrids. Int J Environ Sci Nat Res. 2017; 4(3): 555640. DOI: 10.19080/IJESNR.2017.04.555640.

reported in plots of CSC-4302 as compared to CSC-4704 and CSC-447. Spatial arrangement of plant had non-significant effect and the interaction as well. The possible reason for this could be due to genetic characteristics of tobacco hybrids and each tobacco hybrid showed different response Bukan [6].

Table 1: Plant height (cm) of different tobacco hybrids as affected by various spacing.

Different spacing levels				
Tobacco hybrids	**T_1 (120 x 55 cm)**	**T_2(107 x 55cm)**	**T_3(90 x 60cm)**	**Mean**
CSC-4302	110	119	115	114.7a
CSC-4704	101	101	107	103.0b
CSC-447	103	99	100	100.7b
Mean	104.7	106.3	107.3	

Lsd value $_{(0.05)}$ for varieties=9.4011

Leaf area (cm^2)

Table 2: Leaf area (cm^2) of different tobacco hybrids as affected by various spacing.

Different spacing levels				
Tobacco hybrids	**T_1(120x55 cm)**	**T_2(107x 55cm)**	**T_3(90x60cm)**	**Mean**
CSC-4302	937	942	958	946b
CSC-4704	1132	1166	1127	1142a
CSC-447	1046	1042	993	1027b
Mean	1038	1050	1026	

Lsd value $_{(0.05)}$ for varieties=86.410

Data regarding leaf area of tobacco hybrids indicated that different tobacco hybrids had significant effect on leaf area (Table 2). Maximum leaf area (1142 cm^2) was reported in plot of CSC-4704as compared CSC-4302 and CSC-447. Spatial arrangement of plant had non-significant effect and the interaction as well. The possible reason for this could be due to genetic characteristics of tobacco hybrids and each tobacco hybrids showed different response Bukan[6].

Number of green leaves kg^{-1}

Table 3: Number of green leaves kg^{-1} of different tobacco hybrids as affected by various spacing.

Different spacing levels				
Tobacco hybrids	**T_1(120x 55 cm)**	**T_2(107x 55cm)**	**T_3(90x 60cm)**	**Mean**
CSC-4302	18	16	17	17
CSC-4704	20	15	16	17
CSC-447	15	18	16	16
Mean	18	16	16	

Lsd value $_{(0.05)}$ = ns

Number of cured leaves kg $^{-1}$

Table 4: Number of Cured leaves kg-1 of different tobacco hybrids as affected by various spacing.

Different spacing levels				
Tobacco hybrids	**T_1(120x 55 cm)**	**T_2(107x 55cm)**	**T_3(90x60cm)**	**Mean**
CSC-4302	112	101	104	105
CSC-4704	129	102	114	115
CSC-447	104	110	99	104
Mean	115	104	105	

Lsd value (0.05) = ns

Data regarding number of green leaves kg^{-1} of tobacco hybrids indicated that tobacco hybrids, spatial arrangement and interaction had non-significant effect on number of green leaves kg^{-1} (Table 3). Maximum green leaves kg^{-1} (17) was reported in plots of CSC-4302 and CSC-4704 as compared to CSC-447. While for spatial arrangement maximum green leaves kg^{-1} (17 cm) observed in spacing T_1 as compared to T_2 and T_3.

Data regarding number of cured leaves kg^{-1} of tobacco hybrids indicated that tobacco hybrids, spatial arrangement and interaction had non-significant effect (Table 4). Maximum number of cured leaves kg^{-1} (115) was reported in plots of CSC-4704 as compared to CSC-4303 and CSC-447. While for spatial arrangement maximum number of cured leaves kg^{-1} (115) observed in spacing T_1 as compared to T_3 and T_2.

Cured leaf yield (kg ha^{-1})

Table 5: Cured leaf yield (kg ha^{-1}) of different tobacco hybrids as affected by various spacing.

Different spacing levels				
Tobacco hybrids	**T_1(120x55 cm)**	**T_2(107x 55cm)**	**T_3(90x 60cm)**	**Mean**
CSC-4302	3222	3958	4140	3773
CSC-4704	2793	3868	3797	3486
CSC-447	3504	3632	4392	3842
Mean	3173b	3819a	4109a	

Lsd value $_{(0.05)}$ for spacing=484.48

Data regarding cured leaf yield kg ha^{-1} of tobacco hybrids indicated that different tobacco hybrids and interaction had non-significant on cured leaf yield kg ha^{-1} of different tobacco hybrids (Table 5). Spatial arrangement had significant effect on cured leaf yield kgha^{-1} of different tobacco hybrids. Maximum cured leaf yield kg ha 1 (4109) were reported in plot of spatial T_3 arrangement as compared to spatial T_2 and T_3. The possible reason for this could be due to the genetic adoptability of tobacco hybrids to T_3 spatial arrangement Kharazmi [7] and also similar results were reported by Bukan [6-10].

How to cite this article: Hazrat U, Abdul Q, Nabeela B, Mushtaq A, Muhammad Owais I, et al. Effect of Plant Spacing On Quantitative and Qualitative Characteristics of Fcv Tobacco Hybrids. Int J Environ Sci Nat Res. 2017; 4(3): 555640. DOI: 10.19080/IJESNR.2017.04.555640.

Nicotine contents percentage

Table 6: Nicotine contents percentage of different tobacco hybrids as affected by various spacing.

Different spacing levels				
Tobacco hybrids	T_1(120x55 cm)	T_2(107x 55cm)	T_3(90x60cm)	Mean
CSC-4302	2.4	2.11	2.68	2.40
CSC-4704	2.11	2.28	2.64	2.34
CSC-447	1.99	2.64	2.07	2.23
Mean	2.17	2.34	2.46	

Data regarding nicotine contents percentage of tobacco hybrids indicated that tobacco hybrids, spatial arrangement and interaction had non-significant effect on nicotine contents percentage (Table 6). Maximum nicotine contents percentage (2.40) were reported in plots of CSC-4302 as compared to CSC-4704 and CSC-447. While for spatial arrangement maximum nicotine contents percentage (2.46) observed in spacing T3 as compared to T2 and T1.

Reducing sugar contents percentage

Table 7: Reducing sugar content of different tobacco hybrids as affected by various spacing.

Different spacing levels				
Tobacco hybrids	T_1(120x55 cm)	T_2(107x 55cm)	T_3(90x60cm)	Mean
CSC-4302	19.45	19.6	15.17	18.07
CSC-4704	20.04	16.29	16.99	17.77
CSC-447	18.66	18.9	14.22	17.26
Mean	19.38	18.26	15.46	

Data regarding reducing sugar contents percentage of tobacco hybrids indicated that tobacco hybrids, spatial arrangement and interaction had non-significant effect on nicotine contents percentage (Table 7). Maximum reducing sugar contents percentage (18.07) were reported in plots of CSC-4302 as compared to CSC-4704 and CSC-447. While for spatial arrangement maximum reducing sugar contents percentage (19.38) observed in spacing T_1 as compared to T_2 and T_3.

Conclusion

It was concluded from the results of experiment that variety CSC-447 showed better results from the other two varieties. the variety CSC-447 have tremendous potential to improve various traits such as yield and yield related components and therefore variety CSC-447 are recommended to obtain higher yield and the Row to Row 90 cm and plant-plant 60 cm distance are sufficient for tobacco crop and increasing further spacing in tobacco crop were not significant effect on yield and yield related traits. Hence 90x60cm spacing are good to obtain higher FCV leaf yield and of good quality.

References

1. Ahmed S, F Mohammad, Q Ahmed, MAU Khan (2014) Assessing genetic variation for morpho-agronomic traits of some native and exotic FCV tobacco genotypes in Pakistan. J Agric Environ Sci 14 (5): 428-433.
2. Pakistan Bureau of Statistics and Ministry of National Food Security & Research report 2013-2014.
3. Alizadeh R, M Roshdi, F Jalili, S Rezadoost, JK Mahalleh, et al. (2013) The effect of ammonium nitrate and plant density on yield and vegetative characteristics of burley tobacco (Nicotiana tabacum L) variety no. 21. Adv Environ Biol 7(1): 16-22.
4. Chaplin JF, ZT Ford, JB Pinter, RE Currin (1968) Effect of row and within row spacing on yield and quality of flue-cured tobacco. Agronomy J 60: 314-316.
5. Campbell JS, JF Chaplin, DM Boyette, CR Campbell, CB Crawford (1982) Effect of plant spacings, topping height, nitrogen rates and varieties of tobacco on nicotine yield and concentration. Tobacco Int 184: 72-75.
6. Bukan M, A Budimir, M Boic, H Sarcevic, V Kozumplik (2010) Effect of Within-Row Spacing on Agronomic and Morphological Characteristics of the Flue-Cured Tobacco Cultivars. J Agric Conspec sci 75(1): 27-31.
7. Kharazmi S, R Taghizadeh, A Vahedi (2014) Investigate the effect of planting and densities pattern on quantitative and Qualitative Characteristics Virginial Tobacco (Coker 347) in the west Region Gilan-Talesh. Indian J of Fund and Applied Life Sci 4(3): 598-603.
8. Alavi SR, R Taghavi (2009) Evaluate the effect of plant density on quantitative and qualitative characteristics of male sterile tobacco type of barrel in Urmia region. Research Project Center, Tobacco in Urmia Code 2: 88-102.
9. Mahdavi A, A Gholizadeh (2008) Evaluate the effects of plant density and fertilizer levels on quantitative and qualitative characteristics of cultivar K-326. Project and Training Research Center Mazandaran Tirtalesh Code 2: 86-101.
10. Shariatmadari J (1977) Determine the best chemical fertilizer and planting intervals for Virginia tobacco - Research Letter 1974, Research Center and education, Tirtalesh.

DOI: 10.19080/IJESNR.2017.04.555640

How to cite this article: Hazrat U, Abdul Q, Nabeela B, Mushtaq A, Muhammad Owais I, et al. Effect of Plant Spacing On Quantitative and Qualitative Characteristics of Fcv Tobacco Hybrids. Int J Environ Sci Nat Res. 2017; 4(3): 555640. DOI: 10.19080/IJESNR.2017.04.555640.