Biological Forum – An International Journal **7**(2): 622-625(2015)

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Influence of intercropping corn and cow pea on some characteristic of corn

Mohsen Abbasi, Ahmad Mehraban and Hamid Reza Ganjali
Department of Agronomy, Islamic Azad University, Zahedan Branch, Zahedan, Iran

(Corresponding author: Ahmad Mehraban)
(Received 28 May, 2015, Accepted 15 June, 2015)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Generally, intercropping helps reduce the pressure of weeds. It has been noticed that the ability of intercropping in competing weeds depends on factors such as mixture of tillable plants, selective numbers, and plant aggregation, share of each tillable plant in intercropping, their layout and distance from each other, and prolificacy and moisture of the soil. Corns are mainly intercropped with legumes. One of the most important advantages of this mixture is the capability of stabilizing nitrogen in legumes. The field experiment was laid out split plot with factorial design with three replications. Treatments included wedding (no wedding, once wedding, twice wedding) and intercropping (pure cow pea, pure corn, 50% cow pea + 75% corn, 75% cow pea + 50% corn, 100% cow pea + 100% corn). Analysis of variance showed that the effect of wedding and intercropping on all characteristics was significant (except 1000 grain weight).

Key words: Grain yield, Biological yield, Plant height

INTRODUCTION

In agronomy, natural outlook has been expressed in different forms which stable agriculture is an example. Stable (permanent) agriculture is ascribed to the authentic management of agricultural resources, which in addition to fulfilling the ever-changing needs of humans, maintains the health of environment and capacity of water and soil resources (Reijntjesetal, 1992). From among agricultural elements, one can name agrofarstry, incorporative management of plague, tillage alternation, and intercropping. Although intercropping systems existed as traditional crop since long, yet nowadays many researchers (Ganbari- Bonjar, 2000) have practiced it. Intercropping, the agricultural practice of cultivating two or more crops in the same space at the same time is an old and commonly used cropping practice which aims to match efficiently crop demands to the available growth resources and labor. The most common advantage of intercropping is the production of greater yield on a given piece of land by making more efficient use of the available growth resources using a mixture of crops of different rooting ability, canopy structure, height, and nutrient requirements based on the complementary utilization of growth resources by the component crops. Weeds are among the most important factors in decreasing the yield of agricultural products. In actual conditions of product, keeping the environment free from weeds entails expenses. These expenses include provision and usage of herbicides, human work, and used machines in weed control. In fact many of the producers has mentioned these expenses as the main reason for attempting intercropping, while most of the research done has been taken place on the usage of chemical methods and other methods of weed control (Kuchaki, 2001). Generally, intercropping helps reduce the pressure of weeds. It has been noticed that the ability of intercropping in competing weeds depends on factors such as mixture of tillable plants, selective numbers, plant aggregation, share of each tillable plant in intercropping, their layout and distance from each other, and prolificacy and moisture of the soil (Moody and Shett, 1989). Many concepts have been developed to assess yield advantages as a result of the divergent production goals of different intercropping systems which include; land equivalent ratio (LER) and relative yield total (RYT) (Willey, 1990). Intercropping of cereals with legumes has been popular in humid tropical environments (Tusbo et al., 2005) and rain-fed areas of the world (Gosh *et al.*, 2004) due to its advantages for yield increment, weed control (Poggio, 2005), insurance against crop failure, low cost of production and high monetary returns to the farmers (Ofori and Stern, 1987), improvement of soil fertility through the addition of nitrogen by fixation and transferring from the legume to the cereal (Gosh *et al.*, 2006), improving yield stability, socio-economic and some other advantages (Willey, 1979). Intercropping being an agricultural practice can be used for decreasing the dependency on chemical herbicides in weed control (Banik *et al.*, 2006) and defined as the growing of two or more crop species simultaneously in the same field during a growing season (Ofori and Stern, 1987). Intercropping generates beneficial biological interactions between crops, increases grain yield and stability, helps use the available resources more efficiently and reduces the weed pressure (Jensen, 2007).

The intercropping may lead to an overall yield advantage (Sayed Galal *et al.*, 1979; Ahmed and Rao, 1982; Sayed Galal, 1983 & 1984; Assey *et al.*, 1992a & b; Shafik, 1995 & 2000; Metwally, 1999 and Shafik and Soliman, 1999). Corns are mainly intercropped with legumes. One of the most important advantages of this mixture is the capability of stabilizing nitrogen in legumes. Maize is one of the most sensitive plants in front of weeds so that if not controlled, especially at the initial phases of growth leads to the drastic decrease of product. Yet since legumes are coverage products, while preventing water evaporation also have a muggy effect on different types of weeds in product's crop row (Salamon, 1990). The optimum plant population for maize in sole cropping is 40,000 plants ha-1 under rainfed conditions in the semi-arid Northeast Brazil. Half of this population may be used in intercropping studies in row arrangements of one row of maize to two or three rows of beans (Rao & Morgado, 1984). Lima & Lopes (1981), in a plant population and spatial arrangement study on maize-bean intercropping, reported that intercropping was more advantageous than sole cropping and the highest Land Equivalent Ratios – LERs were obtained in the spatial arrangement of one row of maize to two or three rows of beans. In an intercropping study under temperate climate condition, when maize at a constant plant population was intercropped with three bean plant populations, Morgado & Willey (2003) showed that competitive effect of intercrop beans on maize yields was high at higher plant populations. Specifically among the legumes cowpeas are of great importance for this quality. As the result of mixture of two products, a longer competition period is imposed on weeds. (Shetty and Rao, 1981) realized that in intercropping Egyptian birdseed and peanut, which its density was equal with the relative density of its components, decrease of the weeds was more than peanut's sole crop, but less than birdseed's sole crop. Cowpea is the most economically important grain legume adapted to savanna ecologies where it matures its grain on residual moisture. Nigeria and Niger account for 87% of the world cowpea production (Ortiz, 1998; (FAO), 2003). It is a crop that plays diverse role in contributing to the food security, income generation and soil amelioration for under small-scale farming conditions. The grain contains about 25% protein and 64% carbohydrate and thus has high potential to reduce malnutrition (Fatokun, 2002). The average grain yield of cowpea generally ranges from 0.132 to 0.500 t/ha in the dry savanna (FAO, 2003).

MATERIAL AND METHODS

The experiment was conducted at the zabol which is situated between 31° North latitude and 61° East longitude.

Composite soil sampling was made in the experimental area before the imposition of treatments and was analyzed for physical and chemical characteristics. The field experiment was laid out split plot with factorial design with three replications. Treatments included wedding (no wedding, once wedding, twice wedding) and intercropping (pure cow pea, pure corn, 50% cow pea + 75% corn, 75% cow pea + 50% corn, 100% cow pea + 100% corn). Data collected were subjected to statistical analysis by using a computer program MSTATC. Least Significant Difference test (LSD) at 5 % probability level was applied to compare the differences among treatments` means.

RESULTS AND DISCUSSION

A. Grain yield

Analysis of variance showed that the effect of wedding on grain yield was significant (Table 1). The maximum of grain yield of treatments twice wedding was obtained (Table 2). The minimum of grain yield of treatments no wedding was obtained (Table 2). Analysis of variance showed that the effect of intercropping on grain yield was not significant (Table 1). The maximum of grain yield of treatments pure corn was obtained (Table 2). The minimum of grain yield of treatments 100% cow pea + 100% corn was obtained (Table 2).

B. 1000 grain weight

Analysis of variance showed that the effect of wedding on 1000 grain weight was significant (Table 1). The maximum of 1000 grain weight of treatments twice wedding was obtained (Table 2). The minimum of 1000 grain weight of treatments no wedding was obtained (Table 2).

Table 1: Anova analysis of the corn affected by wedding and intercropping.

S.O.V	df	Grain yield	1000 grain weight	Biological yield	Plant height
R	2	0.03	5709.72	7.43	585.25
wedding (w)	2	55.28^{**}	20457.98^{*}	199.24^{**}	2031.58^{**}
R*W	4	0.18	9183.10	3.89	33.45
Intercropping (I)	3	7.53^{**}	1403.30^{ns}	3.45^{*}	569.29^{**}
W*I	6	1.32^{**}	2907.56^{ns}	3.11^{*}	1320.43^{**}
CV (%)	-	12.10	21.97	13.31	5.90
*, **, ns: significant at $p<0.05$ and $p<0.01$ and non-significant, respectively.					

Table 2: Comparison of different traits affected by wedding and intercropping.

Treatment	Grain yield	1000 grain weight	Biological yield	Plant height
Wedding				
No wedding	1.68c	288.10a	4.33c	138.08c
Once wedding	2.57b	291.53a	6.81b	146.75b
Twice wedding	5.76a	361.27a	12.29a	163.66a
Intercropping				
Pure corn	4.55a	318.58a	8.29a	152.44ab
50% cow pea + 75% corn	3.24b	328.90a	8.21a	158.66a
75% cow pea + 50% corn	3.22b	305.22a	7.80ab	146.88bc
100% cow pea + 100% corn	2.33c	301.82a	6.94b	140c
Any two means not sharing a common letter differ significantly from each other at 5% probability				

Analysis of variance showed that the effect of intercropping on 1000 grain weight was significant (Table 1). The maximum of 1000 grain weight of treatments 50% cow pea + 75% corn was obtained (Table 2). The minimum of 1000 grain weight of treatments 100% cow pea + 100% corn was obtained (Table 2).

C. Biological yield

Analysis of variance showed that the effect of wedding on biological yield was significant (Table 1). The maximum of biological yield of treatments twice wedding was obtained (Table 2). The minimum of biological yield of treatments no wedding was obtained (Table 2). Analysis of variance showed that the effect of intercropping on biological yield was not significant (Table 1). The maximum of biological yield of treatments pure corn was obtained (Table 2). The minimum of biological yield of treatments 100% cow pea + 100% corn was obtained (Table 2).

D. Plant height

Analysis of variance showed that the effect of wedding on Plant height was significant (Table 1). The maximum of Plant height of treatments twice wedding was obtained (Table 2). The minimum of Plant height of treatments no wedding was obtained (Table 2). Analysis of variance showed that the effect of intercropping on Plant height was not significant (Table 1). The maximum of Plant height of treatments 50% cow pea + 75% corn was obtained (Table 2). The minimum of Plant height of treatments 100% cow pea + 100% corn was obtained (Table 2).

REFERENCES

Abraham CT, SinghS P, (1984). Weed management in sorghum legume intercropping systems. *J Agricsci, Cambridge*.**103**: 103-115.

Ahmed S, Rao MR. (1982). Performance of corn-soybean intercrops combination in the tropics: results of a multi-location study. *Field Crops Res.* **5**: 147-161.

Assey AA, Zeidan EM, Eraky AG, Mohamed MA, Sarhan AA. (1992a). Intercropping soybean with corn. 1- Effect of intercropping, soybean plant population and N- Fertilization on growth and growth Analysis of corn and soybean. *Proc. 5th Conf. Agron., Zagazig*, 13-15, Sept.: 496- 515.

Banik P, Midya A, Sarkar BK, Ghose SS. (2006). Wheat and chickpea intercropping systems in an additive series experiment: Advantages and weed smothering. *Europ. J. Agronomy* **24**: 325-332.

Ghanbari-Bongar A, (2000). Wheat-bean intercropping as alow-input forage. Ph. D. Thesis University of London.

Ghosh PK, Manna MC, Bandyopadhyay KK, Ajay TAK, Wanjari RH, Hati KM, Misra AK, Acharya CL, Subba RA. (2006). Inter-specific interaction and nutrient use in soybean-sorghum intercropping system. *Agro. J.*, **98**: 1097-1108.

Ghosh PK. (2004). Growth yield competition and economics of groundnut/cereal fodder intercropping systems in the semi-arid tropics of India. *Field Crops Res.*, **88**: 227-237.

Kuchaki ASP, (2001). Sustainable agriculture. *Journal of Mashhad university.*

Lima, A.F.; Lopes, L.H.O. (1979). Plant population and spatial arrangement study on the intercropping of maize and beans (*Phaseolus vulgaris* L.) in Northeast Brazil. In: International Workshop On Intercropping, Patancheru, 1979. *Proceedings. Patancheru*: ICRISAT, 1981. p.41-45.

Mazaheri D, Bankesaz A, Movahedi D, Hoseinzadeh A, (2001). Effectof intercropping maize and bean on weed control. *pajusazan j*. **13**. 47-51

Moody K, Shett SVR, (1989). Weed management intercrops, on proc. Lnt. Workshop intercropping. *ICRISAT*. Hyderabad. India. 229-237.

Morgado, L.B. (2006). Estudo sobre densidade de plantio de sorgo e feijao-caupi consorciados no semi-arido brasileiro. *Revista Ciência Agronômica*, vol. **37**, p.357-363, 2006.

Ofori F, Stern WR. (1987). Cereal-legume intercropping systems. *Advan. Agron.* **41**: 41-90.

Rao, M.R.; Morgado, L.B. A review of maize-beans and maizecowpea intercropping systems in the semi-arid Northeast Brazil. *Pesquisa Agropecuária Brasileira*, v.**19**, p.179-192, 1984.

Reijntjes C, Haverkortand Waters-Bayer, (1992). Farming for the future, an introduction to Low-external-input and sustainable agriculture. Macmillan Education Ltd.

Salamon E, (1990). Maize - Bean intercrop system in Nicaragua, Effect of plant arrangements and population densities on the land Equivalent Ratio (LER), Relative yield Total (RYT) and weed abundance. Working paper International Rural Development center. *Swewdish university of Agricultural Science*, No, 148, 35pp.

Sayed Galal Jr, Abdalla MMF, Metwally AA. (1983a). Intercropping corn and soybean under different patterns of intercropping. *1st Hon. Con. Agric. Bot. Sci. Univ. Mansoura* 27-28 April. 170-185.

Sharaiha RK and Hatter B, (1993). Intercropping and pouttry manure effects on yield of corn, water melon and soybean growth in calcareous soil in the Jordan Valley. *J. Agron. crop sci.* **171**: 260-264.

Shetty SVR and Rao AN, (1981). Weed management studies in sorghum/pigeon pea and pearl millet/grandnut intercrop systems. Some observations, in proc, Int, Workshop intercropping. ICRISAT. Hydarabad, India.

Shetty SVR and Rao AN, (1981). Weed management studies in sorghum/pigeon pea and pearl millet/grandnut intercrop systems. Some observations, in proc, Int, Workshop intercropping. ICRISAT. Hydarabad, India

Willey RW. (1979). Intercropping its importance and research needs. Part 1. Competition and yield advantages. *Field Crop Abstr.* **32**, 1-10.

Willey RW. (1990). Resource use in intercropping systems. *Agric Water Manag.*, **17**: 215-231.