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Research Article

The Evaluation of Yield and Yield Component of Corn (*Zea mays*) and Peanut (*Arachis hypogaea*) Affect by Intercropping and Manure

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ABSTRACT

Maize (*Zea mays* L.) is the world's widely grown highland cereal and primary staple food crop in many developing countries. To face the growing need for dietary sources, increasing of crop yield is essential. The field experiment was laid out factorial with randomized complete block design with three replications. Treatments included manure in three level (F1: control, F2: 15 ton.ha and F3: 30 ton.ha) and intercropping in four levels (I1: sole peanut, I2: sole maize, I3: one row maize + three rows peanut and I4: one row peanut + three rows maize).Analysis of variance showed that the effect of manure on all characteristics was significant. The maximum of peanut harvest index, grain yield, biological yield and plant height of treatments 30 ton.ha was obtained. Analysis of variance showed that the effect of intercropping on all characteristics was significant. The maximum of peanut harvest index, grain yield and plant height of treatments one row maize + three rows peanut was obtained. Yield advantage occurs because growth resources such as light, water, and nutrients are more completely absorbed and converted to crop biomass by the intercrop over time and space as a result of differences in competitive ability for growth resources between the component crops, which exploit the variation of the mixed crops in characteristics such as rates of canopy development, final canopy size.

Key words: Intercropping, Maize, Peanut, Yield

INTRODUCTION

Peanut (*Arachis hypogaea* L.) is a legume originating from South America and the fourth most popular oil seed in the world, following soy, cotton and canola. The largest worldwide producers of peanut are in Asia, where more than half of its worldwide production is concentrated. The peanut is mainly used for human consumption in natura, processing, or oil production. The peanut is currently being studied as a promising raw material for biodiesel production because of the high concentration of oil in its seeds (Goncalves, 2004). Maize (*Zea mays* L.) is the world's widely grown highland cereal and primary staple food crop in many developing countries (Kandil, 2013). It was originated in America and first cultivated in the area of Mexico more than 7,000 years ago, and spread throughout North and South America (Hailare, 2000). In intensive agricultural systems, crop diversity is reduced to one or very few species that are generally genetically homogeneous, the planting layout is uniform and symmetrical and external inputs are often supplied in large quantities. Such systems have clearly negative impacts on soil and water quality and on biodiversity conservation. In the world production, maize is ranked as the third major cereal crop after wheat and rice (Zamir *et al*., 2013). Population growth and natural resource degradation and subsequent need to increase of food production, are considered as the major problems nowadays. To face the growing need for dietary sources, increasing of crop yield is essential, this will lead to pressure on natural resources and threaten sustainability of farming systems. Therefore, need to design and implementation of sustainable and high yield systems gradually increases (Javanshir *et al*., 2002). To achieve this objective, one of the option is growing plants in mix pattern. Multi-product farming is growing of more than one crop in a farming year and a piece of arable land. Setting of planting date in intercropping planting is far more complex than a single planting, since may contain a mixture of species with different requirements and growing course. Generally, by more differences between species as requirement for environmental factors, the

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amount of product obtained from a mixture was more than single planting (Pasari *et al*, 2000). Clement *et al* (1992) during study on intercropping of corn and soybean in Canada observed that highest corn and maximum soybean product was made in 2:1 and 3:2 row arrangement of corn and soybean. Sharaiha and hattar (1993) in survey the effect of intercropping and litter on the yield of corn, soybean and watermelon in single and mixed planting, stated that highest yield of Corn was obtained in blending with soybean, that produced an Increase up to 45 and 65 percent at level of 40 tons of litter depending on the year of test and maximum yield of soybean was achieved in corn-soy blend with 35 and 34 percent depending on the year of test. Nabavi and Mazaheri (1998) by researching the effects of nitrogen different levels on intercropping of corn and soybean, said that highest LER was obtained from intercropping of both plants in planting ratio of 75% soybeans + 25% corn. Pirzad *et al* (2002) in review of competition performance in corn and soybean intercropping stated that assessment of different treatments using LER showed that corn intercropping in density of 5.3 plants per square meter with density of 42 soybean plants per square meter had the highest biological efficiency. Intercropping systems as an example of sustainable agricultural methods and objectives such as ecological balance. Interest the most out of resources. Increase the quality and quantity performance and development decrease of pests. Diseases and weeds traces (Fernandez *et al*., 2007). Intercropping systems use resources more effectively than a Mono cropping takes place and therefore the amount of available material for use weed decreases (Zimdahl, 1993). In Intercropping with increasing diversity in weed control is less and therefore the number of weeds per unit area decreases (Javanshir *et al*., 2000). Intercropping uniform population of weeds by reducing the relative abundance of dominant weed population changes (Poggio, 2005). Therefore, a mixed crop better exploits the potential of light. Yield advantage occurs because growth resources such as light, water, and nutrients are more completely absorbed and converted to crop biomass by the intercrop over time and space as a result of differences in competitive ability for growth resources between the component crops, which exploit the variation of the mixed crops in characteristics such as rates of canopy development, final canopy size (Sharaiha and hattar, 1993).

MATERIALS AND METHODS

Location of experiment

The experiment was conducted at the Mirjaveh region in Iran.

Composite soil sampling

Composite soil sampling was made in the experimental area before the imposition of treatments and was analyzed for physical and chemical characteristics.

Field experiment

The field experiment was laid out factorial with randomized complete block design with three replications.

Treatments

Treatments included manure in three level (F1: control, F2: 15 ton.ha and F3: 30 ton.ha) and intercropping in four levels (I1: sole peanut, I2: sole maize, I3: one row maize + three rows peanut and I4: one row peanut + three rows maize).

Data collect

Data collected were subjected to statistical analysis by using a computer program SAS. Least Significant Difference test (LSD) at 5 % probability level was applied to compare the differences among treatments` means.

RESULTS AND DISCUSSION

Harvest Index

Analysis of variance showed that the effect of Manure on peanut harvest index was significant (Table 1). The maximum of peanut harvest index of treatments 30 ton.ha was obtained (Table 2). The minimum of peanut harvest index of treatments control was obtained (Table 2). Analysis of variance showed that the effect of intercropping on peanut harvest index was significant (Table 1). The maximum of peanut harvest index of treatments one row maize + three rows peanut was obtained (Table 2). The minimum of peanut harvest index of treatments one row peanut + three rows maize was obtained (Table 2).Clement *et al* (1992) during study on intercropping of corn and soybean in Canada observed that highest corn and maximum soybean product was made in 2:1 and 3:2 row arrangement of corn and soybean. Sharaiha and hattar (1993) in survey the effect of intercropping and litter on the yield of corn, soybean and watermelon in single and mixed planting, stated that highest yield of Corn was obtained in blending with soybean, that produced an Increase up to 45 and 65 percent at level of 40 tons of litter depending on the year of test and maximum yield of soybean was achieved in corn-soy blend with 35 and 34 percent depending on the year of test.

Grain yield

Analysis of variance showed that the effect of Manure on peanut grain yield was significant (Table 1). The maximum of peanut grain yield of treatments 30 ton.ha was obtained (Table 2). The minimum of peanut grain yield of treatments control was obtained (Table 2). Analysis of variance showed that the effect of intercropping on peanut grain yield was significant (Table 1). The maximum of peanut grain yield of treatments one row maize + three rows peanut was obtained (Table 2). The minimum of peanut grain yield of treatments one row peanut + three rows maize was obtained (Table 2). Nabavi and Mazaheri (1998) by researching the effects of nitrogen different levels on intercropping of corn and soybean, said that highest LER was obtained from intercropping of both plants in planting ratio of 75% soybeans + 25% corn. Pirzad *et al.* (2002) in review of competition performance in corn and soybean intercropping stated that assessment of different treatments using LER showed that corn intercropping in density of 5.3 plants per square meter with density of 42 soybean plants per square meter had the highest biological efficiency.

Table 1: Anova analysis of the maize and peanut affected by manure and intercropping

Sov	df	Harvest Index	Grain Yield	Biological yield	Plant height
R	2	359.2	120302.3	92540700	7.37
Manure (M)	2	119.8**	1524286.3**	16668011.1*	160.59*
Intercropping (I)	2	73.9*	842955.8*	18968344.4*	316.39**
M*I	4	208.3**	8158880.5**	24303222.2**	191.34**
Error	16	14.25	199683.4	3927762.5	32.22
CV	-	10.79	6.31	9.46	3.20

*, **, ns: significant at $p<0.05$ and $p<0.01$ and non-significant, respectively.

Table 2: Comparison of different traits of peanut affected by manure and intercropping

Treatment	Harvest Index	Grain Yield	Biological yield	Plant height
Manure				
Control	21.62c	6.33c	29.79b	173.11b
15 ton.ha	28.48b	16.21b	50.62a	177.11ab
30ton.ha	39.59a	19.27a	59.89a	181.55a
Intercropping				
Sole peanut	30.14ab	13.74b	55.05a	170.61b
One row maize + three rows peanut	35.31a	15.93a	44.23b	179.16a
One row peanut + three rows maize	24.24b	12.14b	41.01b	182a

Any two means not sharing a common letter differ significantly from each other at 5% probability.

Biological yield

Analysis of variance showed that the effect of Manure on peanut biological yield was significant (Table 1). The maximum of peanut biological yield of treatments 30 ton.ha was obtained (Table 2). The minimum of peanut biological yield of treatments control was obtained (Table 2). Analysis of variance showed that the effect of intercropping on peanut biological yield was significant (Table 1). The maximum of peanut biological yield of treatments sole peanut was obtained (Table 2). The minimum of peanut biological yield of treatments one row maize + three rows peanut was obtained (Table 2). Intercropping systems as an example of sustainable agricultural methods and objectives such as ecological balance. Interest the most out of resources. Increase the quality and quantity performance and development decrease of pests. Diseases and weeds traces (Fernandez *et al*., 2007). Intercropping systems use resources more effectively than a Mono cropping takes place and therefore the amount of available material for use weed decreases (Zimdahl, 1993).

Plant height

Analysis of variance showed that the effect of Manure on peanut plant height was significant (Table 1). The maximum of peanut plant height of treatments 30 ton.ha was obtained (Table 2). The minimum of peanut plant height of treatments control was obtained (Table 2). Analysis of variance showed that the effect of intercropping on peanut plant height was significant (Table 1). The maximum of peanut plant height of treatments one row peanut + three rows maize was obtained (Table 2). The minimum of peanut plant height of treatments sole peanut was obtained (Table 2). In Intercropping with increasing diversity in weed control is less and therefore the number of weeds per unit area decreases (Javanshir *et al*., 2000). Intercropping uniform population of weeds by reducing the relative abundance of dominant weed population changes (Poggio, 2005). Therefore, a mixed crop better exploits the potential of light. Yield advantage occurs because growth resources such as light, water, and nutrients are more completely absorbed and converted to crop biomass by the intercrop over time and space as a result of differences in competitive ability for growth resources between the component crops, which exploit the variation of the mixed crops in characteristics such as rates of canopy development, final canopy size (Sharaiha and hattar, 1993).

REFERENCES

Clement A, P Chalifour, MP Bharati and G Gendron, 1992. Effect of nitrogen supply and spatial arrangement on the grain yield of maize/soybean intercrop in a humid subtropical climate. J Plant Sci, 72: 57-60.

Fernandez M, JC Sillero and D Rubials, 2007. Intercropping with cereals reduces infection be Orobanchecrenatain legumes. Crop Prot, 26: 1166-1172.

Goncalves A, 2004. Componentes de produção de amendoim em different esarranjos es paciais no Recôncavo Baiano. RevistaBrasileira de Oleaginosas e Fibrosas, Campina Grande J, 8: 801-812.

Hailare L, 2000. Corn: An American Native. Spanning the Gap, The newsletter of Delaware Water Gap National Recreation Area. Afric J Biosci, 22:123-129.

Javanshir A, A Dabbagh Mohammadi Nasab, A Hamidi and M Gholipoor, 2002. Mixed Crop Ecology. Mashhad Jehad Daneshgahi Press, pp: 222.

Kandil EE, 2013. Response of Some Maize Hybrids (Zea mays L.) to Different Levels of Nitrogenous Fertilization. J Appl Sci Res, 9: 1902-1908.

Nabavi S and D Mazaheri, 1998. Impact of different level s of nitrogen fertilizer on mixed crop soybean and corn. J Iran Agric Sci, 29: 455-466.

Pasari B, D Mazaheri and S Peyghambari, 2000. Study growth analysis in mixed and pure crop of soybean cultivar. J Res Bulding, 54: 37-41.

Pirzad A, A Javanshir, H Aliari, M oghaddam and M Shakiba, 2002. Study Competition in mixed and pure crop of corn and soybean by convert yield. J Agric Sci Nat Res, 9: 85-100.

Poggio SL, 2005. Structure of weed communities occurring in monoculture and intercropping of field pea andbarley. Agric Ecosys Environ, 109: 48-58.

Sharaiha RK and B Hattar, 1993. Intercropping and poultry manure affection yields of corn Water melon and soybean growth in a calcareous. Soil in the Jordan alley. J Agron Crop Sci, 171:260-264.

Zamir M, G Yasin and H Javeed, 2013. Effect of different sowing techniques and mulches on the growth and yield behavior of spring planted maize (Zea mays L.). Cercetari Agronomice in Moldova, 1: 77-82.

Zimdahl RH, 2007. Fundamentals of Weed Sciences. Academic Press, New York 666 pp.