Journal of Agroecology and Natural Resource Management
p-ISSN: 2394-0786, e-ISSN: 2394-0794, Volume 3, Issue 1; January-March, 2016 pp. 27-29

http://www.krishisanskriti.org/Publication.html

Effect of Intercropping of Maize (*Zea mays* L.) + Cowpea (*Vigna unguiculata*) on Leaf Stem Ratio, Maize-equivalent Yield and Land Equivalent Ratio

A. S. Dhonde[1], M. S. Pilane[2] and A. N. Mahatre[3]

[1,2,3]*College of Agriculture, Kolhapur- 416004 (India)*

Abstract—*The field experiment was conducted during Kharif 2013 at the Agronomy Farm, College of Agriculture, Kolhapur on sandy clay loam soil with different row ratio of maize-cowpea fodders under sole and intercropping systems for getting higher maize equivalent yield and leaf stem ratio. Maize + cowpea in the ratio of 2:2 were equally good and significantly superior to rest of the systems. The intercropping of maize with cowpea in a row ratio of 2:2 recorded maximum leaf stem ratio (0.98 and 0.86) at harvest, maize equivalent yield (565.09 qt) and land equivalent ratio (1.15).*

Keywords*: Maize, cowpea, intercropping, leaf stem ratio, Maize equivalent yield land equivalent ratio*

1. INTRODUCTION

Production of quality forage plays an important role in dairy industry. Availability of green forage to animals is the key to success of dairy enterprises and it is difficult to maintain the health and milk production of the livestock without supply of the green fodder. Fodder and feeds are the major inputs in animal production especially in milch animals, which account for about 60 to 70 per cent of total cost of milk production.

1. M.Sc. (Agri) student, 2. Assistant Professor, 3. M.Sc. (Agri) student

The scarcity of green forages and grazing resources in the country has made the livestock to suffer continuously with malnutrition, resulting in their production potentiality at sub optimum level as compared to developed nations. India is having the largest livestock population of 520 m heads which is about 15 per cent of the world's livestock. India accounts 55 per cent of world's buffaloes, 16 per cent of the world's cattle, 20 per cent of the world's goats and 4 per cent world's sheep population but is having only 4.4 per cent of the cultivated area under fodder crops with an annual total forage production of 833 million tonnes (390 million tonnes i.e. green and 443 million tonnes i.e. dry). Whereas, the annual forage requirement is 1594 million tonnes (1025 million tonnes green and 569 million tonnes dry) to support the existing livestock population. The present feed and fodder resources of the country can meet only 48 per cent of the requirement with a vast deficit of 61.1 per cent and 21.9 per cent of green and dry fodder, respectively (Anonymous, 2009).

Intercropping has been recognised as a beneficial system of crop production as well as is one of the potent means of better utilization of resources and higher fodder production per unit area per unit time. Toniolo *et al.* (1987) reported significantly higher crude protein (CP) content of maize-soybean intercropping than that of mono cropped maize. Javanmard *et al.* (2009), worked on intercropping of maize with different legumes, observed that dry matter yield and crude protein yield of forage were increased by all intercropping systems as compared with the maize monoculture. Dahmardeh *et al.* (2009) concluded that intercropping of maize and cowpea resulted in more digestible dry matter and also crude protein content than maize sole cropping.

2. MATERIALS AND METHODS

An experiment was conducted during *kharif* season of 2013 at the Farm of the College of Agriculture, Kolhapur, Maharashtra. The soil of the experimental field was sandy clay laom in texture, medium in available nitrogen (257.55 kg ha^{-1}) and phosphorus (26.78 kg ha^{-1}) and fairly rich in available potassium (246.84 kg ha^{-1}) with pH 7.7. Total seven treatments *viz*, T_1: Maize Sole, T_2: Cowpea Sole, T_3: Maize + Cowpea 1:1 row ratio, T_4: Maize + Cowpea 3:1 row ratio, T_5: Maize + Cowpea 4:1 row ratio, T_6: Maize + Cowpea 2:2 row ratio and T_7: Maize + Cowpea 3:2 row ratio in RBD with three replications. The varieties African tall and *Phule Pandhari* were used as test crop, respectively for maize and cowpea were sown, 30 cm spacing in row proportion as per treatments in second week of June. The seed rate under sole cropping was maintained at 75 and 40 kg ha^{-1}, respectively for maize and cowpea. The package of practices recommended for crops were adopted for cultivation of fodders. Both crops were harvested for green-dry forage yield. The economics was worked out considering the current market prices.

3. RESULT AND DISCUSSION

Leaf stem ratio:

Leaf stem ratio were significantly affected by various treatments (Table 1). The mean leaf stem ratio of maize (0.66 and 0.91) and cowpea (0.52 and 0.82) at 42 DAS and at harvest, respectively.

Among the intercropping treatments, Maize + Cowpea (2:2) row ratio recorded significantly highest leaf stem ratio of maize (0.70 and 0.98) and cowpea (0.58 and 0.86) at 42 DAS and at harvest, respectively over rest of other treatments. However, Maize + Cowpea (3:1) row ratio, Maize + Cowpea (4:1) row ratio and Maize + Cowpea (3:2) row ratio were statistically on par with Maize + Cowpea (2:2). Similar finding regarding leaf stem ratio were observed by Ram S. N. and Singh Bhagwan (2002).

Maize- equivalent yield (q ha^{-1}):

Maize equivalent yield were significantly affected by various treatments (Table 1).

Among the intercropping treatments, Maize + Cowpea (2:2) row ratio recorded significantly highest maize- equivalent yield (565.09 qt) over rest of other treatments. However, Maize + Cowpea (3:1) row ratio, Maize + Cowpea (4:1) row ratio, Maize + Cowpea (3:2) row ratio and Maize + Cowpea (1:1) were statistically on par with each other. Similar finding regarding maize equivalent yield were observed by Balyan (1997).

Land-equivalent ratio (LER)

A perusal of data in Table 2 indicated that among the intercropping treatments, Maize + Cowpea (2:2) row ratio recorded highest land equivalent ratio (1.15) over rest of other treatments. The treatments (T_3) maize + cowpea (1:1) and (T_7) maize + cowpea (3:2) were recorded lowest values of LER than other systems. The results support the findings of Kumar *et al*. (2005) and Sharma *et al*. (2008) under cereal + legume intercropping system.

Table1: Mean leaf stem ratio of maize and cowpea as influenced periodically by maize + cowpea intercropping system

Treatment	Maize		Cowpea	
	42 (DAS)	At harvest (DAS)	42 (DAS)	At harvest (DAS)
T1) Maize Sole	0.71	0.98	----	----
T2) Cowpea Sole	----	----	0.59	0.98
T3) Maize + Cowpea 1:1	0.62	0.77	0.44	0.74
T4) Maize + Cowpea 3:1	0.68	0.97	0.56	0.85
T5) Maize + Cowpea 4:1	0.64	0.92	0.53	0.80
T6) Maize + Cowpea 2:2	0.70	0.98	0.58	0.86
T7) Maize + Cowpea 3:2	0.64	0.89	0.52	0.77
S.E. ±	0.02	0.03	0.02	0.03
C.D.at 5%	0.06	0.09	0.06	0.09
General Mean	0.66	0.91	0.53	0.83

Table 2: Maize – equivalent yield and land equivalent ratio as influenced by maize + cowpea intercropping system

Treatment	Maize-Equivalent Yield (q ha-1)	Land equivalent Ratio
T1) Maize Sole	570.80	1.0
T2) Cowpea Sole	315.00	1.0
T3) Maize + Cowpea 1:1	393.41	0.79
T4) Maize + Cowpea 3:1	526.10	1.06
T5) Maize + Cowpea 4:1	507.39	1.04
T6) Maize + Cowpea 2:2	565.09	1.15
T7) Maize + Cowpea 3:2	450.49	0.88
S.E. ±	23.43	----
C.D.at 5%	72.21	----
General mean	475.46	----

REFERENCES

[1] Anonymous, 2009. Post harvest management of crop residues /grasses/fodder crops and their value addition for sustaining livestock. *Winter School*, Indian Grassland and Fodder Research Institute, Jhansi. pp. 13-23.

[2] Chang J. F. and Richard M. Shibles, 1985. Maize + cowpea intercrop system effect of nitrogen fertilizer on productivity and efficiency. Field Crop Research (12): 145-152.

[3] Dahmardeh, M.; Ghanbari, A.; Syasar, B. and Ramroudi, M. 2009. Effect of intercropping maize (*Zea mays L.*) with cowpea (*Vigna unguiculata*) on green forage yield and quality evaluation. *Asian Journal of plant Sciences*, **8** (3) : 235-239.

[4] Ganajaxi, Halikatti S. I., Hiremath S. M. and Chittapur B. M. 2010. Intercropping of maize and French bean. Agri. Reviews **31**(4): 286-291.

[5] Javanmard, A., Dabbagh-Mohammadi, A,; Nasab, A.; Javanshir, A.; Moghadam, M. and Janmohammadi, H. 2009. Forage yield and quality in intercropping of maize with different legumes as double cropped. *Journal of Food, Agriculture and Environment*. **7** (1) : 163-166.

[6] Jose Moacri Pinheiro Lima Filho.1999. Physiological responses of maize and cowpea to intercropping. Pesq. agropec.bars.Brasillia v.35, n.5, 915-921

[7] Kumar, S.; Rawat C. R. and Melkania, N.P. 2005. Forage production potential and economics of maize (*Zea mays*) and cowpea (*Vigna unguiculata*) intercropping under *rainfed* conditions. *Indian Journal of Agronomy*, **50** (3) : 184-186.

[8] Patel J. R. and Rajgopal S. 2003. Nitrogen management for production of sorghum (*Sorghum bicolor*) and cowpea (*Vigna unguiculata*) forage under intercropping system. Indian Journal of Agronomy **48**(1): 34-37.

[9] Sharma, R.P., Singh, A.K., Poddar, B.K. and Raman, K.R. 2007. Forage production potential and economics of maize (*Zea mays*) with legumes intercropping under various row proportions. *Indian Journal of Agronomy*, **52**(2) : 121-124.

[10] Singh Bhagwan. 2003. Physical growth parameters, forage yield and nitrogen uptake of sorghum(*Sorghum bicolor*) as influenced with legume intercropping, harvesting time and nitrogen level. Indian Journal of Agronmy **48**(1):38-41

[11] Toniolo, L., Sattin, M. and Mosca, G. 1987. Soybean-maize intercropping for forage, *Eurosoya*, **5** : 73-78.

[12] Taraih N. M., T.A.T. Wahua., 2001. Effect of component populations on yields and land equivalent ration of intercropped maize and cowpea. Vol.No. **26** (3): 89-92.