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Research Paper

Effect of row ratio in cereal-legume fodder under intercropping systems on biomass production and economics

V.H. SURVE, M.K. ARVADIA AND B.B. TANDEL

See end of the paper for authors' affiliations

Correspondence to :

V.H. SURVE
Department of Agronomy, N.M. College of Agriculture, Navsari Agricultural University, NAVSARI (GUJARAT) INDIA
Email : vaishus_dream@rediffmail.com

ABSTRACT

Field experiments were conducted during summer season 2007 and 2008 at college farm, Navsari campus on clayey in texture soils with different cereal-legume fodders under sole and intercropping systems for getting higher fodder yield and economics. Green and dry fodder yields of sorghum/maize, cropping systems either sole sorghum or sorghum + cowpea in the ratio of 2:1 were equally good and significantly superior to rest of the systems. The intercropping of sorghum with cowpea in a row ratio of 2:1 recorded maximum land-equivalent ratio (1.51), gross (Rs. 60744/- ha^{-1}) and net (Rs. 50031/- ha^{-1}) realization along with higher benefit: cost ratio (5.67).

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KEY WORDS : Cereal-legume intercropping, Row ratio, Fodder yield, Economics

Quality forage production 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. The present availability of green fodder is about 513 million tonnes projecting a deficit of 53 per cent and that of dry fodder is around 400 million tonnes against the requirement of 676 millions tonnes (Mukherjee *et al.,* 1998). 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. The intercropping of pulses with sorghum enhances the dry matter accumulation in sorghum as reported by (Kulkarni, 1976 and Bainade, 1979). The beneficial effects of a suitable row ratio for cereal-legume intercropping system can be assessed through various competition functions (Rafey and Prasad, 1996).

RESEARCH PROCEDURE

An experiment was conducted during summer season of 2007 and 2008 at the farm of the College of Agriculture, Navsari, Gujarat. The soil of the experimental field was clayey in texture, medium in available nitrogen (259 kg ha^{-1}) and phosphorus (30.63 kg ha^{-1}) and fairly rich in available potassium (348 kg ha^{-1}) with pH 7.7. Total 9 treatments consisted of T_1: sole sorghum, T_2: sole maize, T_3: sole cowpea, T_4: sorghum + cowpea 1:1, T_5: sorghum + cowpea 1:2, T_6: sorghum + cowpea 2:1, T_7: maize + cowpea 1:1, T_8: maize + cowpea 1:2 and T_9: maize + cowpea 2:1 in RBD with three replications. The varieties GFS-5, African tall and EC-4216 were used as test crop, respectively for sorghum, maize and cowpea which were sown, 30 cm spacing in row proportion as per treatments in first week of march. The seed rate under sole cropping was maintained at 40, 60 and 40 kg ha^{-1}, respectively for sorghum, maize and cowpea. The package of practices recommended for crops were adopted for cultivation of fodders. Three crops were harvested for green-dry forage yield. The economics was worked out considering the current market prices.

RESEARCH ANALYSIS AND REASONING

The results obtained from the present investigation have been discussed in the following sub heads :

Green-dry forage yield:

Green-forage yield were significantly affected by various treatments (Table 1). The treatment (T_6) sorghum + cowpea (2:1) secured the highest total green fodder yield and was significantly superior to rest of the treatments. The data also indicated that all systems of sorghum + cowpea showed yield advantage over sole sorghum. In case of maize + cowpea systems, only (T_9) maize + cowpea (2:1) showed higher green fodder yield than sole maize, whereas, maize + cowpea in 1:1 and 1:2 ratio system decreased the green fodder yield over sole maize. Sorghum + cowpea in 2:1 ratio system (T_6) increased the green fodder yield by 27.30 and 120.50 per cent, respectively over sole sorghum (T_1) and sole cowpea (T_3). Similarly, (T_9) maize + cowpea in 2:1 ratio system increased the green fodder yield by 28.53 and 68.19 per cent, respectively over sole maize (T_2) and sole cowpea (T_3). The lowest total green fodder (22.95 t ha^{-1}) yield was recorded with (T_3) sole cowpea but it was at par with (T_7) maize + cowpea (1:1). The higher yield of sorghum and cowpea under particular treatments is attributed to better development of various growth parameters of respective crop. The probable reason may be sorghum being C_4 possess higher yield potential than cowpea. Moreover, under cereal-legume intercropping system better utilization of crop production resources might have increased the yield. The results are in agreement with those reported by Patel and Rajagopal (2001) and Sharma *et al.* (2008).

The data on total dry fodder yield clearly indicated that various treatments of sole and intercropping systems significantly differed among each other. The highest total dry fodder yield was obtained under (T_6) sorghum + cowpea (2:1) and found superior to remaining systems. The data also indicated that among various intercropping cropping systems (T_6) and (T_9) sorghum and maize along with cowpea in 2:1 row ratio showed yield advantage over sole cropping of respective crops. Treatments (T_4), (T_5), (T_7) and (T_8) sorghum or maize along with cowpea in 1:1 or 1:2 row ratios reduced the dry fodder yield over sole cropping of respective crops. Sorghum + cowpea in 2:1 system (T_6) increased the dry fodder yield by 13.95 and 236.18 per cent, respectively over sole sorghum (T_1) and sole cowpea (T_3). Similarly, maize + cowpea in 2:1 system (T_9) increased the dry fodder yield by 11.66 and 170.55 per cent, respectively over sole maize (T_2) and sole cowpea (T_3). The lowest total dry fodder yield was recorded with treatment (T_3). These results confirmed the findings of Sharma *et al.* (2008).

Economic feasibility:

The data on economics of different cropping systems of sorghum, maize and cowpea are presented in Table 2. Prevailing market prices of green forage of different crops and various inputs used in experiment are also furnished in Table 2.

The data in Table 2 clearly indicated that treatment (T_6) sorghum + cowpea (2:1) secured the maximum gross (Rs. 60744/- ha^{-1}) and net (Rs.50031/- ha^{-1}) realization along with higher BCR of 5.67 which was followed by (T_5) sorghum + cowpea (1:2) and (T_4) sorghum + cowpea (1:1) with Rs. 41072 and 41286 ha^{-1} and net realization, respectively and BCR of 4.91 and 4.89. The results are in accordance with the findings of Chalka and Nepalia (2005) and Sharma *et al*. (2008) under cereal + legume intercropping system.

Land-equivalent ratio (LER):

A perusal of data in Table 2 clearly indicated that land equivalent ratio significantly influenced under various intercropping systems. Treatments (T_6) sorghum + cowpea (2:1), (T_9) maize + cowpea (2:1) and T_5 sorghum + cowpea

Table 1 : Green fodder and dry fodder yields in sorghum, maize and cowpea as influenced by various intercropping systems

Treatments	Yield (t ha^{-1})					
	Green fodder			Dry fodder		
	Sorghum / maize	Cowpea	Total	Sorghum / maize	Cowpea	Total
T_1 Sole sorghum	39.76	--	39.76	14.16	--	14.16
T_2 Sole maize	30.04	--	30.04	11.62	--	11.62
T_3 Sole cowpea	--	22.95	22.95	--	7.09	7.09
T_4 Sorghum + Cowpea (1:1)	33.68	9.56	43.25	11.99	2.96	14.95
T_5 Sorghum + Cowpea (1:2)	27.89	15.10	42.99	9.93	4.67	14.59
T_6 Sorghum + Cowpea (2:1)	37.77	12.85	50.62	13.44	3.97	17.41
T_7 Maize +Cowpea (1:1)	18.64	8.83	27.48	7.21	2.73	9.94
T_8 Maize + Cowpea (1:2)	19.82	9.78	29.60	7.67	3.02	10.69
T_9 Maize +Cowpea (2:1)	27.60	11.01	38.61	10.68	3.40	14.08
C.D. (P=0.05)	4.97	2.34	5.34	1.81	0.73	1.90

Table 2 : Cost of cultivation, gross and net return, benefit: cost ratio and land equivalent ratio as affected by various intercropping systems

Treatments	Gross realization (Rs. ha^{-1})	Cost of cultivation (Rs. ha^{-1})	Net realization (Rs. ha^{-1})	BCR	LER
T_1 Sole sorghum	47712	10881	36831	4.38	1.00
T_2 Sole maize	36048	10901	25147	3.31	1.00
T_3 Sole cowpea	27540	10348	17192	2.66	1.00
T_4 Sorghum + Cowpea (1:1)	51900	10614	41286	4.89	1.26
T_5 Sorghum + Cowpea (1:2)	51588	10516	41072	4.91	1.37
T_6 Sorghum + Cowpea (2:1)	60744	10713	50031	5.67	1.51
T_7 Maize + Cowpea (1:1)	32976	10624	22352	3.10	1.01
T_8 Maize + Cowpea (1:2)	35520	10530	24990	3.37	1.09
T_9 Maize + Cowpea (2:1)	46332	10719	35613	4.32	1.40
C.D. (P=0.05)	-	-	-		0.15

Selling rate of produce
Green fodder (Sorghum, maize and cowpea) : Rs. 1200/-t^{-1}

Rates of inputs
Nitrogen : Rs. 10.87 kg^{-1} N
Phosphorus : Rs. 20.62 kg^{-1} P_2O_5
Labour : Rs. 100 day^{-1} $labour^{-1}$

(1:2) were statistically at par and recorded higher values of LER compared to other systems. The treatments (T_7) maize + cowpea (1:1) and (T_8) maize + cowpea (1:2) were statistically at par and 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.

Authors' affiliations:

M.K. ARVADIA AND B.B. TANDEL, Department of Agronomy, N.M. College of Agriculture, Navsari Agricultural University, NAVSARI (GUJARAT) INDIA

LITERATURE CITED

Bainade, S.S. (1979). Studies on growth, yield and quality and economics of growing sorghum CSH-6 in three-crop intercropping system. M.Sc. (Ag.) Thesis, Marathwada Agricultural University, PARBHANI, M.S. (India).

Chalka, M.K. and Nepalia, V. (2005). Production potential and economics of maize (*Zea mays*) intercropped with legumes as influenced by weed control. *Indian J. Agron.,* **50** (2): 119-122.

Kulkarni, V.K. (1976). Planting pattern and intercropping experiment of *Kharif* sorghum as base crop and green gram as an intercrop. M.Sc. (Ag.). Thesis, Marathwada Agricultural University, PARBHANI, M.S. (India).

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 J. Agron.,* **50** (3): 184-186.

Mukherjee, A.K., Malti, S. and Nanda, M.R. (1998). Strategy for maximization of forage production. Proc. National Seminar on Strategy for maximization of forage production by 2000A.D. held at 'BCKV.West Bengal. pp. 5-7.

Patel, J.R. and Rajagopal, S. (2001). Production potential of forage maize (*Zea mays*) with legumes under intercropping system. *Indian J. Agron.,* **46** (2): 211-215.

Rafey, A. and Prasad, N.K. (1996). Competition function and economic viability of intercropping of sorghum (*Sorghum bicolor*) and blackgram (*Phaseolus mungo*) in drylands. *Indian J. Agron.,* **41** (4): 522-524.

Sharma, R.P., Singh, A.K., Poddar, B.K. and Raman, K.R. (2008). Forage production potential and economics of maize (*zea mays*) with legumes intercropping under various row proportion. *Indian J. Agron.,* **53** (2):121-124.

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