https://doi.org/10.29321/MAJ.10.A03417

Madras agric. J. 61 (8): 392—397, August, 1974

Effect of Methods of Intercropping Maize and Cowpea on the Quality of Forage

BY

S. C. SHARMA[1] and H. G. SINGH[2]

ABSTRACT

The study indicates that cross planting of maize with cowpea surpassed all other methods of intercropping in terms of crude proteins mineral matter ether extract and nitrogen free extract production of fodder without increasing crude fibre content.

INTRODUCTION

Planting of maize and cowpea across each other does not reduce forage dry weight but increases the production of animal feed units like total dry matter and digestible energy.

Malik (1952) and Ahlgren (1956) reported that cowpea grown mixed with non-legumes formed a balanced ration. Kravtsov (1957) and Ipekdzhiyan and Nikitenko (1959) observed that the protein content became higher when corn was planted with legumes than when grown in pure stand. Budvitene (1962) and Kalinina (1962) reported poor quality of fodder when maize and legumes were grown mixed. Maissuryan (1962). Lisenkov (1962). Thorpe (1964) and Singh and Sogani (1968), however, reported production of more protein when non-legumes and legumes were planted mixed.

MATERIALS AND METHODS

The trial was conducted in a double split-plot design in the rainy season of 1967-68 and 1968-69 at the Agronomy Farm of the College of Agriculture, Udaipur having clay loam soil. The main-plot treatments consisted of 4 methods of intercropping maize with cowpea, i. e. (1) maize alone, (2)

1. Ph. D. Scholar, at present Project Officer [Special Schemes] Secretariat, Department of Agriculture Jaipur, 2. Professor and Head of the Department of Agronomy, College of Agriculture, Udaipur.

maize and cowpea in alternate rows. (3) maize and cowpea sown across each other at right angles, and (4) maize and cowpea in 3:1 rows. The sub-plot treatments were 3 methods of phosphate application, i. e. (1) plough-sole placement (2) cross working, and (3) band placement. A basal dressing of single super-phosphate was given at the time of sowing to supply 40 kg P_2O_5/ha.

Sub-plot treatments were 4 levels of nitrogen applications as top dressing i. e. 0, 20, 40 and 60 kg N/ha in three equal split doses, at sowing, one month after planting and at tasseling stage of the crop. Ganga-3 Hybrid variety of maize and an improved local variety of cowpea crops were used as companion crops. The germination percentage of maize and cowpea crops was 85 per cent and 90 per cent respectively. Seed rate of pure stand of maize was adjusted according to standards prevalent. In case of mixed sowing, plots 1:1 and 3:1 ratio of maize and cowpea, had one row of cowpea, 3 rows of maize and one row of cowpea respectively. In the case of cross planting plots, maize and cowpea, were planted across each other at their normal seed rates and spacing. Sowing was done on June 30, 1967 and July 3, 1968. The crop was rainfed and harvested for fodder on September 20,1967, and September25, 1968. Determination of crude protein, crude fibre, nitrogen free extract, ether extract and mineral matter in the harvested forage for both the years were used as criteria for treatment evaluation.

RESULTS AND DISCUSSION

Data (Table 1) show that when compared with the growing of solid maize, cross planting of maize with cowpea produced 2.72, 0.68, 2.01, 0.34 and 4.47 quintals more crude protein, crude fibre, mineral matter, ether extract and nitrogen free extract per hectare respectively over a period of two years and the differences were statistically significant. Percentage in crude protein, crude fibre, mineral matter, ether extract and nitrogen free extract were 5[illegible].9, 3.7, 37.8, 26.0 and 9.6 respectively. The crude protein and mineral matter production were found in the decreasing order when maize cowpea in 3:1 lines, maize alone and alternate methods of intercropping were followed. Thus cross planting of maize with cowpea surpassed all other methods of intercropping maize with cowpea in terms of crude protein, mineral matter, ether extract and nitrogen free extract production of the fodder without increasing crude fibre production.

Significantly increased production of quality elements appears to have been brought about by significantly increased dry matter production and better composition of the fodder. While every increases in the proportion of legume to non-legume in fodder tended to improve its quality, associated weight loss was so much that small grain in quality was of no economic value. Kravtsov (1957), Ipekdzhiyan and Nikitenko (1959), Plesa (1961) and Budvitene (1962) also observed lower yields associated

TABLE 1. Effect of methods of intercropping on the production of quality elements (q/ha)

Methods of intercropping	Dry matter	Crude protein	Crude fibre	Mineral matter	Ether extract	Nitrogen free extract
Maize alone						
1/Cobs	21.18	2.02	2.32	0 54	0.48	15.77
2/Stalk	57.16	3.24	15.80	4.77	0.73	32.56
	78.34	5.26	18.12	5.31	1.21	48.33
Maize+Cowpea alternate						
1/Cobs	10.58	0.98	1.14	0.28	0.23	7.90
2/Stalk	33.16	1.88	8.60	2.76	0.42	19.47
	43.74	2.86	9.74	3.04	0.65	27.37
3/Cowpea	14.88	2.21	3.50	1.84	0.35	6.98
	58.62	5.07	13.24	4.88	1.00	34.35
Maize+Cowpea Cross-Sown						
1/Cobs	16.57	1.66	1.75	0.47	0.38	12.28
2/Stalk	51.59	3.13	12.53	4.26	0.67	30.86
	68.16	4.77	14.38	4.73	1.05	43.14
3/Cowpea	20.59	3.22	4.42	2.59	0.50	9.86
	88.75	7.99	18.80	7.32	1.55	53.00

Table 1 [Continued]

Methods of intercropping	Dry matter	Crude protein	Crude fibre	Mineral matter	Ether extract	Nitrogen free extract
Maize+Cowpea 3 : 1 lines						
1/Cobs	15.68	1.46	1.70	0.39	0.34	11.82
2/Stalk	47.88	2.73	12.75	3.95	0.57	27.75
	63.65	4.19	14.45	4.34	0.91	39.57
3/Cowpea	9.72	1.47	2.24	1.16	0.22	4.59
	73.28	5.66	16 69	5.50	1.13	44.16
S Em ±	1.08	0.69	0.25	0.13	0.04	1.05
C D at 5 %	2.97	0.23	0.83	0.36	0 11	2.89

with higher protein content in mixed sowings of legumes and non-legumes.

Data (Table 2) show that while crude protein, mineral matter and ether extract percentage of cross planted maize cowpea was found to increase its crude fibre and nitrogen free extract percentage decreased. Increase in crude protein due to increased proportion of legume to non-legume appears to be due to greater production of legume fraction of fodder which had very high content of protein. Reduced fibre content with increased proportion of legume to non-legume appears to be due to reduced fibre content of legume as compared to that of non-legume. This view coincides with the findings of Singh and Tomar (1962) and Singh and Sogani (1968)

Data (Table 3) show that even after removing the cobs from cross planted maize cowpea forage it does not dilute the content of crude protein or increase the content of crude fibre. A further glance on data (Table 1) shows that crude protein production by stalk + cowpea from cross planted maize cowpea forage is 20 per cent greater than that from solid maize

TABLE 2. Effect of methods of intercropping on quality elements (0/0) *

Methods of intercropping	Crude protein	Crude fibre	Mineral matter	Ether extract	Nitrogen free extract
Maize alone	6.67	23.18	6.81	1.55	61.62
Maize + Cowpea (alternate)	8.62	22.44	8.30	1.73	58.84
Maize + Cowpea (Cross sown)	8.99	21.03	8.12	1.75	59.93
,, (3 : 1 Lines)	7.70	22.67	7.52	1.58	60.42
S Em ±	0.05	0.18	0.11	0.07	0.25
C D at 5 %	0.14	0.51	0.80	N.S.	N.S.

* Mean values of 1967–68 and 1968–69

TABLE 3. Effect of methods of intercropping on the quality of forage after removing cobs from cross planted maize cowpea *

Methods of Intercropping		Crude fibre (per cent)	Crude Protein (per cent)
Maize alone	...	23.18	6.67
Maize + Cowpea (alternate)	...	22.44	8.62
,, (Cross sown)	...	23.47	8.79
,, (3 : 1 lines)	...	22.67	7.70
S Em ±	...	0.18	0.06
C D at 5 %	...	0.50	0.16

* Mean values of 1967-68 and 1968-69.

after removing cobs. Respective increase in crude protein content of maize cowpea forage after grain removal over solid maize without cob removal were about 36 per cent. The high crude protein and mineral matter production by cross planted maize and cowpea seem to be due to additive effect of dry matter production and protein and mineral matter content of forage. Cross planted maize and cowpea mixture absorbed more nitrogen and converted into proteins because of legume association and probably because of cob removal which has low crude protein but high fibre and addition of cowpea which has more protein content.

REFERENCES

AHLGREN, G. H. 1956. *Forage crops.* McGraw Hill Book Co., Inc. NY.

BUDVITENE, V. 1962. Corn legume mixtures. Kukuruza. **5** : 3—1.

IPEKDZHIYAN, V. M. and N. D. NIKITENKO. 1960 The relations between leguminous and plants in mixed stands of maize with soys. *Fiziol. Rast.* **6** : 491—3. (*Soils* and *Fertil*) **23** : 387.

KALININA, Z. G. 1962. Mixed sowings of corn with fodder beans. *Kukuruza* **3** : 22—5.

KRAVTSOV, A. V. 1957. Corn in a mixture with leguminous crops. *S. kh. Povolzhia* **5** : 41—2.

LISENKOV, A P. 1962. Store houses of protein. *Pairods* **10** : 12—4.

MAISURYAN, N. A. 1962. Plant proteins. *Pairoda.* **10** : 37—6.

MALIK, H C 1952 Improved varieties of fodder crops for the Punjab. *Indian Fmg.* **2** : 10.

PLESA, I. 1961. Investigation on irrigation regime, fertilizer dose and the best density to fodder silage maize. *Lucrari Stiintifice Inst. Agronomic. N. Balcescu Ser.* A. **5** : 215—5.

SINGH, R. R. and P. S. TOMAR. 1962. Studies on the yield and qeality of four Kharif fodders *(Sorghum vulgare, Zea mavs, Cvamopsis psoralioide and Vigna Catajang)* grown pure and mixed as influenced by two methods of sowing. *B. V. Agri. Sci. Res.* **4** : 9—15.

SINGH, H. G. and A. K. SOGANI. 1968. Effect of legume component on the relationship between quality and quantity of sorghum forage. *Madras agric. J.* **55** : 161—7.

THORPE, R J. 1964. Cereal Legume silage mixtures for the Northern Guineazone, Nigeria. *Trop. Agri.* **41** : 41—5.