OPTIMIZING THE CONTRIBUTION OF COWPEA TO FOOD AND FODDER PRODUCTION IN CROP-LIVESTOCK SYSTEMS IN WEST AFRICA

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ABSTRACT

Cowpea is important for the provision of both grain for food and fodder for livestock but there is often a trade-off between production of the two. To better understand influences on grain and fodder production, and how these may be utilized, research was conducted at 5 locations in west Africa using 12 cowpea varieties, with and without insecticide spray. Spraying had a dramatic effect on grain production, but less so for fodder, however there was an effect of spraying on fodder quality in terms of *in sacco* digestibility at Niamey. Accessions with the potential to produce grain and fodder with good quality were identified (IT89KD-391 and TVU 12349) and studies are continuing to optimise the contribution of such material to local production systems.

KEYWORDS

Cowpea, *Vigna unguiculata*, dual purpose legumes, crop-livestock systems, west Africa.

INTRODUCTION

In semi-arid west Africa, cowpea (*Vigna unguiculata* (L.) Walp.) is an essential and valuable fodder resource for livestock. Cowpea grain is also used as food and thus forms an important component of the diets of millions (Rachie, 1985). Farmers grow grain as well as fodder type varieties but in the absence of insecticides, they often get more fodder than grain and opt for varieties that favour fodder production with low grain yields (Tarawali *et al*., 1996). In this system, farmers may gain up to 25 % of their annual cash income from fodder sales (ICRISAT, 1991). At the end of the growing season, cowpea fodder (*harawa*) is cut, rolled and stored in tree-forks or on rooftops for use or sale during the harsh dry season. Post-flowering insect pests are a major limiting problem for cowpea grain production and insecticide spraying may be used to ensure that some grain yield is achieved (Singh and Jackai, 1985). In view of the apparent compensation between grain and fodder production of the crop, ILRI and IITA have carried out collaborative research to identify dual purpose varieties and optimise their contribution to both food and fodder resources. The present study included the effects of genotype, environment and insecticide spraying on the quantity of grain and the quantity and quality of fodder.

METHODS

The trial was established in 1995 at 5 sites in Niger and Nigeria: Niamey (semi-arid), Gumel (semi-arid), Minjibir (semi-arid), Zaria (subhumid) and Ibadan (subhumid). 12 cowpea accessions were used, 11 as listed in Figures 1 and 2 together with a local variety which was Ife Brown at Ibadan and Dan Illa at other locations. The trial was a split plot design with spraying as the main plot and cowpea variety as the subplot. Subplots were 4 m * 5 m and consisted of 4 rows of cowpea with 0.5 m and 20 cm between and within rows, the central two rows were used for sampling. Trials were established once the rains were steady at each location, meaning Ibadan was planted first in May 1995 and Niamey last in July 1995. Three seeds per hill were sown and the plots were weeded throughout the experiment. Spray and no-spray plots were separated by two rows of maize (Ibadan) or millet (other locations) to prevent spray drift. Sherpa plus[1] was used to spray the plots three times at 10 to 14 day intervals beginning with the onset of flowering of the early maturing accessions. As pods ripened they were harvested from the central area up to the time of fodder harvest. To assess fodder yield, two 1 m^2 quadrats per plot were harvested 85 days after planting; dry matter yields of leaf, stem and immature pods were assessed; for Ibadan and Niamey, the dry samples were ground through a 2.5 mm mesh for 48 hour *in sacco* digestibility (Osuji *et al*., 1993).

RESULTS AND DISCUSSION

Figures 1 and 2 show, for the five locations, the fodder and grain yields respectively. For all sites except Zaria, the fodder yields were not significantly different for sprayed and not sprayed plots, however, grain yield was significantly influenced by spraying at all sites, with many accessions failing to yield any grain without spraying. This is related to the effects of post-flowering insect pests, the most serious limitation to cowpea grain production (Singh and Jackai, 1985). Highest fodder yields were at Minjibir, reaching almost 10,000 kg/ha for IT86D-715; at Zaria, spraying had a negative effect on fodder production. Grain yields at Ibadan were generally very low and this may be related to the fact that, in contrast to the present trial, cowpea is more commonly grown in the late (second) wet season in this region, when there is likely to be a dry period to allow pod maturing. Grain yields at Minjibir, Zaria and Gumel compare favourably with other on-station yields, reaching over 2,000 kg/ha for IT86D-716 and IT90K-277-2. Grain yields at Niamey were lower, but still, for those accessions that reached maturity, within the range for this very dry environment (Singh and Tarawali, 1996).

At Niamey, *in sacco* digestibility of the fodder was significantly affected by spraying, with unsprayed plots having a mean of 63 % compared to 58 % for sprayed. Fodder digestibility at Niamey ranged from 48 % (IT86D-715) to 69 % (TVU 12349) with the higher values (above 60 %) generally for fodder types. Interesting exceptions to this were accessions IT89KD-391 and TVU 12349 which (with spraying) both gave grain as well as fodder but had higher than 60 % digestibilities. At Ibadan, spraying did not significantly affect digestibility, and values ranged from 56 % (IT86D-716) to 62 % (Kanannado) and accessions that produced grain, albeit low yields, had lower digestibility. IT89KD-391 was again amongst the best in terms of fodder production and digestibility.

The study has shown that cowpea accessions, such as IT89KD-391, with the potential to produce grain and good quantities of quality fodder can be identified. In order to optimise the production of such material, and hence, its contribution to both food and fodder production, studies are continuing to investigate appropriate management practices such as no spraying, but using intercropping with cereals to reduce insect pressure (as is the farmers' practice). New initiatives also include studies on improving fodder quality (Singh and Tarawali, 1996).

REFERENCES

ICRISAT. 1991. ICRISAT west African programmes annual report, 1990. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Niamey, Niger.

Osuji, P.O., I.V. Nsahlai and H. Khalili. 1993. Feed Evaluation. ILCA Manual No. 5. International Livestock Centre for Africa (ILCA), Addis Ababa, Ethiopia.

[1] This was the available insecticide and its use for this experiment should not be regarded as a recommendation.

Rachie, K.O. 1985. Introduction. Pages xxi-xxviii *in* S.R.Singh and K.O.Rachie, eds. Cowpea Research, Production and Utilization. John Wiley & Sons Ltd, UK.

Singh, K.R. and L.E.N. Jackai. 1985. Insect pests of cowpeas in Africa: their life cycle, economic importance and potential for control. Pages 217-231 *in* S.R.Singh and K.O.Rachie, eds. Cowpea Research, Production and Utilization. John Wiley & Sons Ltd, UK.

Singh, B.B. and S.A. Tarawali. 1996. Cowpea: an integral component of sustainable mixed crop-livestock farming systems in west Africa and strategies to improve its productivity. *in* Proceedings of an international workshop on Crop Residues in Sustainable Mixed Crop-Livestock Farming Systems. ICRISAT, Hyderabad, India. April 1996.

Tarawali, S.A., B.B. Singh, M. Peters and S.F. Blade 1996. Cowpea haulms as fodder. Proceedings of the 2nd World Cowpea Research Conference, Accra, Ghana, September, 1995. International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria.

Figure 1
Dry fodder yields ((kg/ha)leaf, stem and immature pods) for cowpea accessions at different locations, with and without insecticide spray.

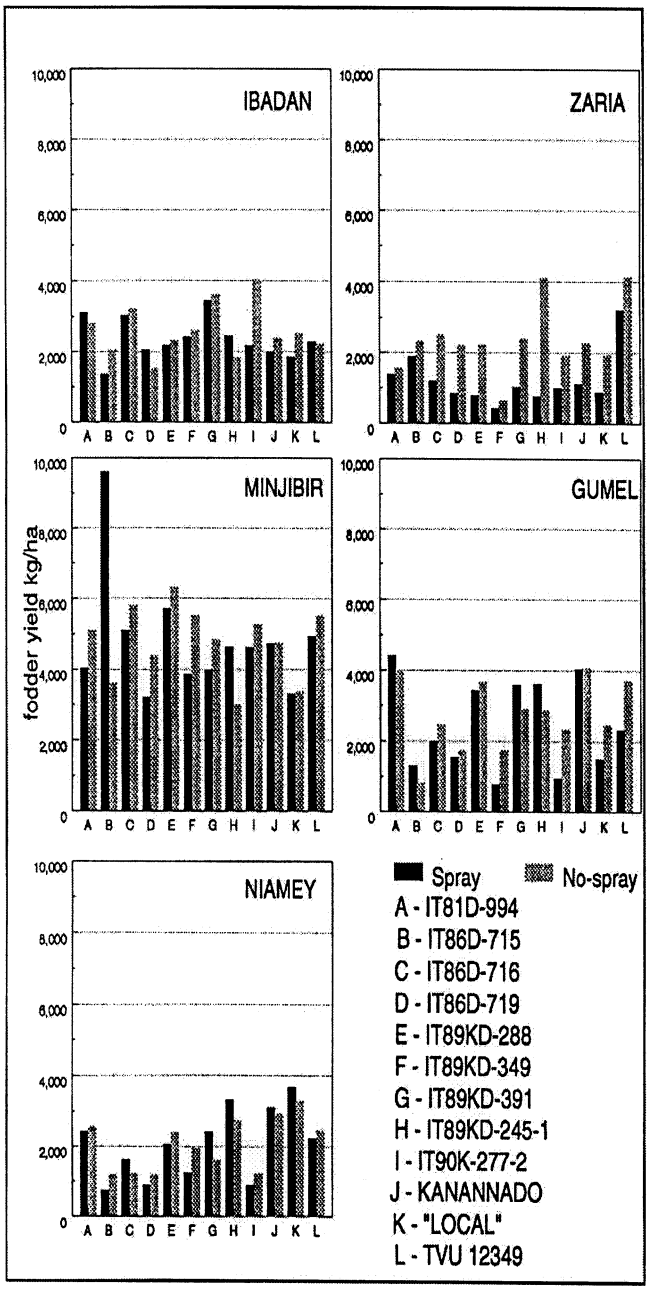

Figure 2
Grain yields (kg/ha) for cowpea accessions at different locations, with and without insecticide spray.