Cowpea variety mixtures for optimal leaf and seed yields when intercropped with maize in Central Tanzania

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Introduction

The multipurpose legume cowpea (Vigna unguiculata) is a very important source of protein and micronutrients for resource-poor farmers in Africa. Usually, leaves, grains and pods are consumed (Fig. 1).

Unpredictable climatic conditions cause high variability in leaf and grain yields, especially in marginal environments. Most farmers need to increase their production to avoid significant shortfall of nutrient supply throughout the year.

Variety mixtures increase the intra-specific diversity off-farm and, thereby, could contribute to both higher yield stability as well as optimal leaf and seed yields for multipurpose use of the crop.

Materials & Methods

Five cowpeas of different growth performance (Tab. 1) were selected as components to be incorporated into 15 two to five-way mixtures (Tab. 2).

Each treatment was intercropped with maize (Stuka M1). The trial was planted both on station and on farm.

Three weeks after sowing, young leaves were harvested every two weeks until flowering started. Total leaf dry matter and seed yields are presented here.

The relative effect of a particular mixture was calculated by relating its yield increase or decrease to the mean of the corresponding components.

Local knowledge about cowpea plant types and mixtures was assessed by interviewing 50 farmers through a semi-structured questionnaire (Fig. 4).

Results

Fig. 2: Relative mixture effects of 15 different cowpea mixtures over their corresponding components in dry matter leaf yield and seed yield (a) on station and (b) on farm (significant effects marked with *).

Fig. 3: Mean total dry matter leaf yields against variance of interaction effects across different harvests for all mixtures and their corresponding cowpea individual components (a) on station and (b) on farm.

Results & Discussion

Farmers appreciated variety mixtures with more emphasis on the need for reasonable supply of both leaf and seed (Fig. 5).

Mixtures with both growing types allow smallholder farmers to increase their diversity since spreading types are rarely grown alone.

There were no significant mixture effects on leaf or seed yields except for a few 2-way mixtures (Fig. 2), both on station and on farm.

Complex mixtures had always low leaf yield variability, probably due to reduced GxE interaction (Fig. 3).

Conclusions

Classifying cowpeas into growing types is not sufficient to predict mixture effects.

The main advantage of higher diversity in the mixture is more leaf yield stability over time.

Screening two-way mixtures helps identify generally favourable components for more complex ones.

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Fig. 1: Different cowpea products.

Fig. 4: Farmers from Gawaye filling the questionnaire.

Fig. 5: Responses of 50 farmers from Gawaye village in Dodona about cowpea and the concept of mixtures.