Journal Sci. Res. Dev., 2002, Vol. 7, 9-16

Seed Protein Characterisation of Some Selected Cultivated Amaranthus Accessions

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ABSTRACT

The total seed protein of 16 accessions of ***Amaranthus hybridus*** *(Amaranths) from the NIHORT germplasm were investigated by SDS- polyacrylamide gel electrophoresis. The result of the electrophoresis indicate that the seed proteins of the Amaranthus are heterogeneous and they composed of 54 polypeptide bands with apparent molecular weight of 2 to 106 kilodaltons. The result showed that there was only one band common to all accessions and the accessions could not be separated by seed colour on the basis of staining intensities and presence/absence of bands. Accessions with the same seed colour had a higher similarity index indicating a closer relationship when compared to seeds with different colour. SDS-polyacrylamide gel electrophoresis is a valuable tool in classifying the Amaranth germplasm and the genetic and evolutionary relationships among the accessions could be determined based on similarity indices.*

INTRODUCTION

The genus *Amaranthus* L. comprises 50 or more species with most of then found in Africa and America (Gbile, 1983). It is represented in Nigeria by seven species of which *A. hybridus, A. dubius, A. spinous* are widely cultivated as vegetables while *A. graecizans, A. lividus, A. spinous* are grown as weeds and *A. tricolour* as ornamental plants (IIIoh, 1990).

Amaranth is one of the 23 tropical plants recommended for studies aimed at enhancing food quality in the tropics (Sauer, 1967). One of the most important characteristics of the Amaranth grain is that its storage protein content is higher and better balanced in essential amino acids than those of nearly all cereals (Ruskin, 1984). Amaranths have been described as a taxonomically difficult group due to the easy occurrence of interspecific hybridization amongst the species (Sauer, 1967). A high level of complexity exists in the species and differentiation between cultivars of different species or of the same species is tedious.

A larger number of accessions of *A. hybridus* are in the gene bank of the Nigerian Institute of Horticultural Research, Ibadan, Nigeria (NIHORT). There is need to have a detailed breeding plan for the Amaranth. Thus, identification of the various accessions is important. In this paper, we present results on the variability in seed protein profiles among the different accessions of *A. hybridus* and seek to determine if any relationship exists between the presence or absence of a specific polypeptide band with general characteristic of the crop such as seed colour.

MATERIALS AND METHODS

Mature dry seeds of 16 accessions of *A. hybridus* collected from NIHORT were used in this study (Table 1). The dry seeds were ground to a fine powder using a mortar and a pestle. The flour was defatted by washing with 3 changes of cold-acetone for 4-6 hours under continuous stirring. The acetone was removed by filtration and samples were air-dried at room temperature. The defatted meal was homogenized in 5ml of 0.05m Tris-glycine butter (pH 8.3) at 4^0C. The total seed protein fraction was recovered as the supernatant by centrifugation at 5,000rpm for 30mins at 4^0C (Odeigah *et al.*, 1999).

Ten percent of SDS-polyacrylamide slab gel electrophoresis of the protein fraction was carried out using a discontinuous gel technique as described by Odeigah and Osanyinpeju (1996). The gels were removed, stained for 20mins with 2% (w/v) Coomasie blue at 65^0C in a water bath, destained for 20 minutes and left overnight in 8% (v/v) acetic acid at room temperature (29 ± 2 ^{0}C) for complete destaining.

Electrophoregrams were photographed and later placed on a light box to observe and measure the distance migrated by all the bands resolved on the gel. Comparison of electrophoretic patterns of the different accessions of *A. hybridus* was performed using similarity index as proposed by Vaughan (1973). Electrophoretic mobility was calculated according to the method of Weber and Osborn (1969).

RESULTS

In this paper 16 accessions listed in Table 1 with some of their morphological characteristics were investigated. Stem colour ranged from purple to green with majority having purple stems. The seed colour varied from black and brown to pale yellow (cream) and yellow. Figure 1 shows a complete schematic representation of the protein profiles analysed by SDS-polyacrylamide gel electrophoresis. A total of 54 different polypeptide bands were resolved which had apparent molecular weights ranging from 2 kilodaltons (KDa) in band 54 to 106KDa in band 1. A close examination of the bands showed that the different accessions had different protein banding