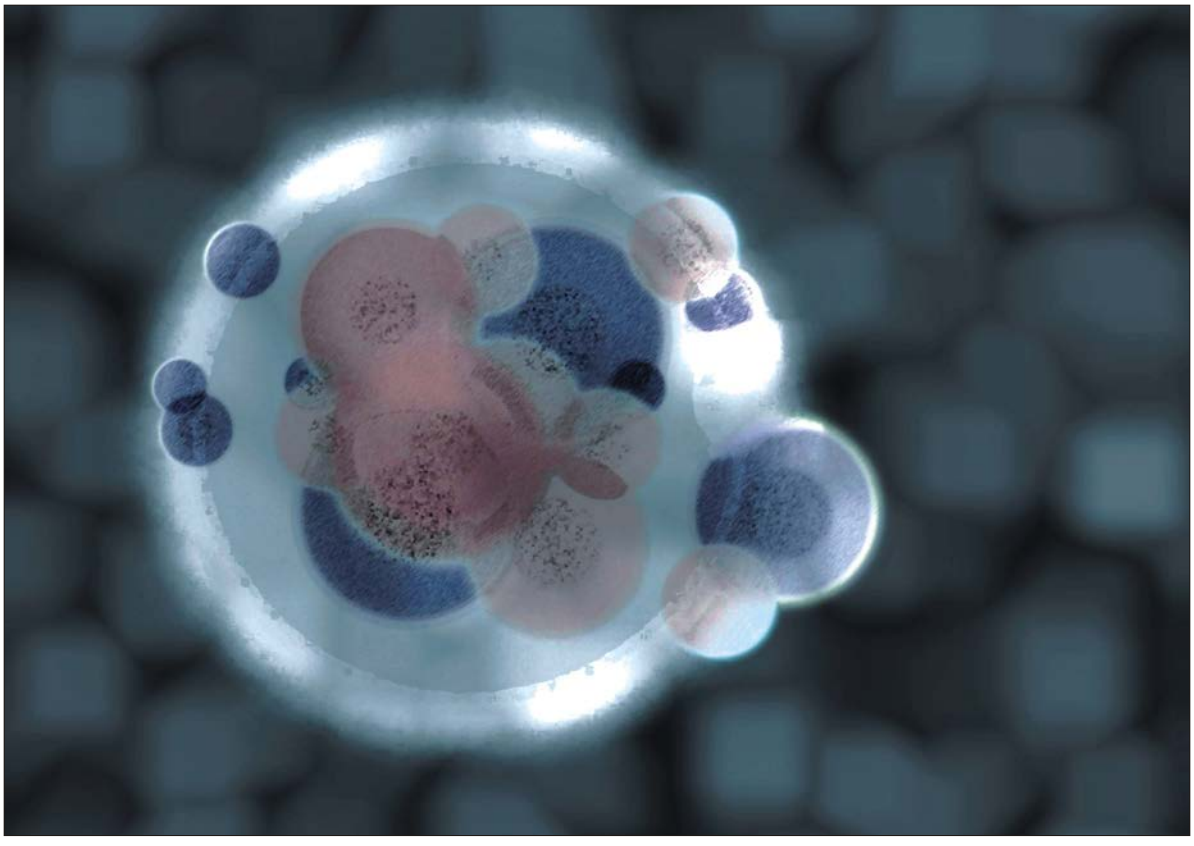

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Palynological Studies on Some Nigerian Species of *Vigna savi*

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Abstract: Palynological studies on eight species of *Vigna* namely *V. ambacensis, V. gracillis*, *V. racemosa*, *V. reticulata*, *V. subterranea*, *V. triloba*, *V. unguiculata* and *V. vexillata*, was carried out. Observations from the investigation showed that the pollen grain is circular and psilate in *V. reticulata*, circular and echinate in *V. unguiculata* and *V. racemosa*, elliptic and monocolpate in *V. ambacensis* and *V. vexillata,* circular and polyporate in *V. subterranea* and circular and dicolpate in *V. gracillis* and *V. triloba*. The variation in pollen morphology showed that *V. reticulata* and *V. subterranea* can be separated from the rest of the taxa based on the shape and type of their pollen grains. Also *V. unguiculata* and *V. racemosa,* can be grouped together just as *V. ambacensis* and *V. vexillata*, *V. gracillis* and *V. triloba* based on each pair having the same shape and type of pollen grains, respectively. From this study, it is likely that the nature of pollen grains in these taxa could be an evolutionary modification often inherited to determine the mode of pollination and thereby perpetuate a particular group of plants in a given environment.

Key words: Pollen grains, structure, *Vigna* taxa, Leguminosae, Papilionoideae

INTRODUCTION

The genus *Vigna* belongs to the family Leguminosae-Papilionoideae and tribe Phaseoleae which is made up of about 80-100 species that are tropical especially in Africa and Asia. In recent years, it has been observed that there is discripancy in the number of species recognized by different authorities. Daniel (1960) recognized 37 species, Hutchinson and Dalziel (1954) recognized 25 species while Burkill (1995) recognized 22 species. The reason for the confusion and discrepancies in estimation of the number of taxa in these groups of plants is due to the perceived similarities in structural and reproductive biology of these bean plants.

Several species of *Vigna* are of considerable economic importance in many developing countries. For example *Vigna unguiculata* (L.) and *Vigna radiata* (L.) Wilezek are key dietary staples for many millions of people (Wilding *et al.*, 1992). *Vigna subterranea* Thouars; Dc., *Vigna aconitifolia* (Jacq) Marechal and *Vigna umbellata* (Thunb) Ohwi and Ohashi are important in the diets of many societies. The *Vigna* species are also valued as forage, cover and green manure crops in many parts of the World (Singh *et al.*, 1970). The economic *Vigna* species exhibit a number of attributes that make them particularly valuable for inclusion in many types of cropping systems. They can be grown successfully in extreme environments such as high temperatures, low rain fall and poor soils with few economic inputs (White, 1972). *Vigna* food products exhibit many excellent nutritional attributes and these products produce a needed complement in diets comprised mainly of roots, tubers or cereals (Padulosi, 1997; Pasquet, 1996). They are not only used as sources of food for humans and livestock but also for soil conservation and fertility maintenance (Cobinna, 1992). Most *Vigna* species such as *Vigna unguiculata*, *Vigna radiata*, *Vigna subterranea* etc are sometimes called the poor - man's meat owing to their uses as a primary protein source (Chopra and Swamy, 1975).

Palynological attributes of plants have attracted the attention of many researchers in recent time. Nyananyo (1985), on pollen morphology of Talineae showed that palynology provides useful data for the intrageneric classification of the large genera. Nyananyo (1987), Nyananyo and Olowokudejo (1986) also used seed coat morphology and other palynological features of *Talinum* and *Calandrinia* to produce a more acceptable classification of the species in these taxa.

Similarly, Edeoga *et al.*, (1996, 1998), Edeoga and Gomina (2001) and Nyananyo (1990) have utilized pollen attributes to establish probable evidence of relationships among certain groups of flowering plants in Nigeria. According to them, the main characters of taxonomic value in pollen grain are the number and position of furrows, pollen wall morphology, symmetry and shapes and sizes of pollen grains.

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Edeoga and Ikem (2002) also showed that *Boerhavia coccinea* is characterized by tricolpate pollen grains while *B. erecta* and *B. diffusa* have alcopate pollen grains hence *B. coccinea* could therefore be distinguished from other Nigerian collections of *Boerhavia* based on pollen characters. The vairation in shape, aperture, polar unit, symmetry and difference in wall sculpture of pollen grains have been used by many authors in the delimitation of various taxa (Agwu and Uwakwe, 1992; Agwu and Osibe, 1992; Edeoga *et al*., 1996; Lezine and Edorh, 1991; Angeles, 1992).

This study is based on the hypothesis that palynological studies has played a major role in the delimitation of taxa but has not been used in the genus *Vigna* to the author's knowledge hence the need for this study with the objectives of examining the pollen morphology of eight *Vigna* species and using the pollen characters for the systematic grouping and characterization of the taxa.

MATERIALS AND METHODS

Mature plants of the eight species of *Vigna* namely *V. ambacensis*, *V. gracillis*, *V. racemosa*, *V. reticulata*, *V. subterranea*, *V. triloba*, *V. unguiculata* and *V. vexillata* were collected from different locations in Eastern Nigeria. This study was conducted in October 2005 at the Science Laboratory of Michael Okpara University of Agriculture, Umudike Umuahia, Abia State Nigeria. The specimen were taken to Forestry Herbarium Ibadan (FHI) for proper identification. The voucher specimen were deposited at the Michael Okpara University of Agriculture Umudike, Abia State Nigeria.

Mature flower head of each of the *Vigna* species was collected and teased out on a slide. Samplings were made on fresh flowers from plants in their natural conditions as these do not undergo any form of deterioration (Edeoga *et al*., 1996, 1998). Samples for light microscope were acetolysed (Erdtman, 1960) which involves the introduction of the acetolysed mixture comprising acetic anhydride mixed with concentrated sulphuric acid (H_2SO_4) in the ratio of 9:1 to the centrifuged materials in the plastic test tubes. The tubes were immersed in boiling water bath for 3-5 min after which they were allowed to cool and the supernatant decanted. The residue was washed twice with water and decanted, about 5 drops of glycerine alcohol in the ratio of 2:1 was added to the precipitates and transferred into labeled specimen tubes for storage. Unstained acetolysed pollen grains were embedded in glycerine jelly and sealed with wax after covering with zero cover slip. Photomicrographs of the pollen grains were taken using a Leitz Wetzler ortholux microscope fitted with vivitar- V-335 camera (Fig. 1 and 2).

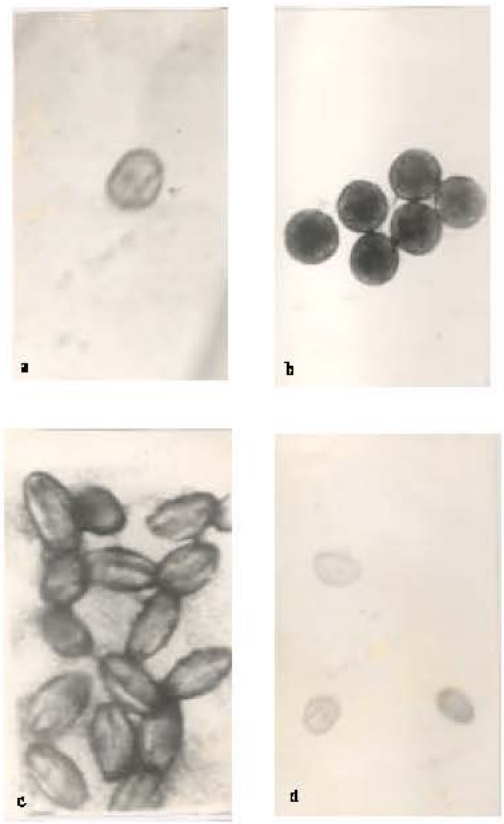

Fig. 1(a-d): Pollen morphology of the *Vigna* species studied. (a) *V. gracillis* with circular and dicolpate pollen, (b) *V. reticulata* with circular and psilate pollen, (c) *V. vexillata* with elliptic and monocolpate pollen, (d) *V. triloba* with circular and dicolpate pollen, (X100)

RESULTS AND DISCUSSION

The pollen morphology of the *Vigna* species investigated is quite different but of generalized types found among the dicotyledons (Table 1). The pollen grain is circular and psilate in *V. reticulata* (Fig. 1b), circular and echinate in *V. unguiculata* and *V. racemosa* (Fig. 2a, c) elliptic and monocolpate in *V. ambacensis* and *V. vexillata* (Fig. 2b and 1c), circular and polyporate in *V. subterranea* (Fig. 2d), circular and dicolpate in *V. gracillis* and *V. triloba* (Fig.1a-d). The differences in pollen morphology are significant and could be exploited for systematic purposes. Applying these variations in pollen morphology to the *Vigna* species studied, *V. reticulata* can be separated from the rest of the taxa just as *V. subterranea* can be distinguished from others. *V. unguiculata* and *V. racemosa* could be grouped

Table 1: Pollen morphology of the eight *Vigna* species studied

Pollen characters	*V. ambacensis*	*V. gracillis*	*V. racemosa*	*V. reticulata*	*V. subterranea*	*V. triloba*	*V. unguiculata*	*V. vexillata,*
Pollen shape	Elliptic	Circular	Circular	Circular	Circular	Circular	Circular	Elliptic
Pollen aperture	Colpus	Colpus	Porus	Porus	Porus	Colpus	Porus	Colpus
Number of aperture	1	2	15-20	1	10-15	2	10-12	1
Pollen wall	Psilate/ smooth	Psilate/ rough	Echinate/ smooth	Psilate/ smooth	Psilate/ smooth	Psilate/ rough	Echinate/ smooth	Psilate/
Aperture type	Monoclpate	Dicolpate	Polyporate	Monoporate	Polyporate	Dicolpate	Polyporate	Monoclpate

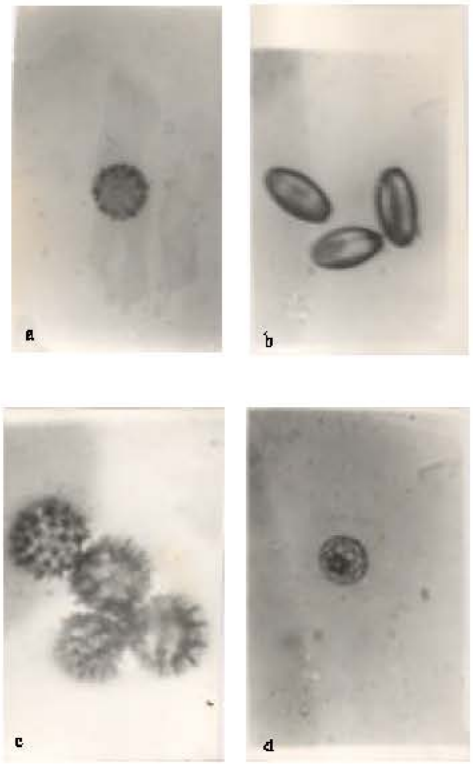

Fig. 2(a-d): Pollen morphology of the *Vigna* species studied. (a) *V. unguiculata* with circular and echinate pollen, (b) *V. ambacensis* with elliptic and monocolpate pollen, (c) *V. racemosa* with circular and echinate pollen, (d) *V. subterranea* with circular and polyporate pollen (X100)

together just as *V. ambacensis* and *V. vexillata* based on these taxa having the same shape and type of pollen grains, respectively. *V. gracillis* and *V. triloba* also possess the same shape and type of pollen grain. In all the species studied, the pollen grains are longer than wide, this could be a structural adaptation for effective dispersal of the pollen grains by wind. Moreso, the circular nature of some of the pollen grains are related to structural adaptation for effective pollination by insects (Gimenes, 1991; Edeoga *et al*., 1996). From this study, it is likely that the nature of pollen grains could be an evolutionary modification often inherited to determine the mode of pollination and thereby perpetuate a particular group of plants in a given environment (Lowe and Soladoye, 1990; Ogwal, 1990). From the pollen size and type, one can strongly argue that hybridization may be operating because the relatively large pollen size and the smallest pollen are features that suggest that there may be indiscriminate mating leading to hybridization (Edeoga and Okoli, 1996). The differences in pollen grains are not enough for re-classification of the species studied, but the similarities in structure among the investigated taxa showed interspecific relationships of the individual species.

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