COLLECTION, CHARACTERIZATION AND EVALUATION OF SELECTED GENETIC RESOURCES FROM LAND RACES OF *ORYZA SATIVA* LINN.

ELIZABETH CHIAMAKAUMUNNAKWE

B. Sc. (Hons.) BOTANY, UMUDIKE.

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CERTIFICATION

This is to certify that this study was carried out by UMUNNAKWE Elizabeth Chiamaka in the Department of Botany, ObafemiAwolowo University, Ile-Ife, and has been approved to meet part of the requirements for the award of the degree of Master of Science in Botany of ObafemiAwolowo University, Ile-Ife, Osun State, Nigeria.

Prof. J. O. Faluyi	_____	_____
(Supervisor)	**Signature**	**Date**
Dr. C. C. Nwokeocha	_____	_____
Co-Supervisor	**Signature**	**Date**
Dr. A. E. Folorunso	_____	_____
(Ag. Head of Department)	**Signature**	**Date**

DEDICATION

Dedicated to the most and always faithful God for His faithfulness to me before, during and after this study.

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ABSTRACT

Seeds of some landraces of rice, *Oryza sativa*Linn., collected from farmers in different agro-zones and locations in Nigeria were raised, selected, characterized and evaluated. The pattern of protein distribution in the seeds of the selected landraces was also determined. Thiswas with a view to documenting the agro-botanical characteristics of the selected landraces of rice; determining the potentials of the characters documented for utilization in rice improvement programme; and investigating the pattern of protein distribution in the seeds of the selected landraces.

The rice seeds were planted in a nursery at the reforestation nursery site, the Department of Botany, ObafemiAwolowo University, Ile-Ife, in 2013 and transplanted to a plot after four weeks for field evaluation. A spacing of 30 x 30 cm within rows was used and 60 cm distance between collections from different locations. Selections were made based on tillering habit, panicle density and days to maturity. The selections were planted out in lines with the same spacing and at the same plot in 2014. Data were collected on morphological parameters such as culm height, tiller number,culm strength, length and breadth of flag leaf and leaf below the flag leaf, ligule length; and panicle characters according to the *DescriptorsforRice*, *Oryza sativa* L. Pattern of protein distribution of the rice grainswere determined according to standard procedure. Data collected wereanalysed using descriptive statistics; cluster analysis for similarity or difference among the selections and correlation analysis for relationship among characters of the selections.

The results revealed that among the selections, IFWPr^{++}Fs-115 had the highest culm height while AWGUIIPr^{++}Fs-78had the shortest; AWGUIII-113 had the highest tiller number,

IFWPr^{++}Fs-115 and IJsllwFs-02 had the longest panicle and rachis lengths, respectively. IFWPr^{++}Fs-258 and IFWPr^{++}Fs-55were observed to have the highest number of primary and secondary branches while highest number of tertiary branches was observed in AWGUIIFs-04. IFWPr^{++}Fs-258 had the highest number of spikelets per panicle. The dendrogram of the cluster analysis carried out showed that selections from Ijesa-Isu and Ikole populations are closely related; AGWU populations are probably from the same stock while the Ifewara population had a wide genetic variability which made it cluster with the AGWU populations. Results of the correlation analysis showed that characters such as culm height, tiller number, flag leaf, number of primary and secondary branches, and ligule length could be considered as selection criteria in breeding programme. The transverse section of the seeds of the selections showed rows and clusters of protein bodies in the aleurone layer, some showed bands of protein bodies in the aleurone layer with some protein bodies extending into the endosperm.

The study concluded that there is a wide genetic variability across the various collections of the landraces of rice and this could be of great potentials for rice improvement

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The genus *Oryza* Linn., belongs to the tribe Oryzeae which is a member of the grain or grass family Poaceae. There are 12 genera within the Oryzeae tribe. The genus *Oryza* contains approximately 22 species of which 20 are wild species and two, *O. sativa* Linn., and *O. glaberrima* Steud., are cultivated (Vaughan, 1994). *Oryza sativa* is the most widely grown of the two cultivated species. It is grown worldwide, including Asian, North and South American, European Union, Middle East and African countries including Nigeria in which there are rice cultivating communities in nearly all agro-zones such as the South West, South East Nigeria. The word "rice" generally indicates a plant and a crop of this species. *Oryza glaberrima,* however, is grown solely in West African countries (Organisation for Economic Co-operation Development, 1999).

The genus *Oryza* has a basic chromosome number of x = 12. The cultivated species, *O. sativa* and *O. glaberrima,* and some wild species such as *O. longistaminata* A. Chev. *et* Roehr., *O. nivara* Sharma *et* Shastry, among others, are diploids with 24 chromosomes; eight wild species are tetraploids with 48 chromosomes in which *O. minuta* Presl. *et* Presl., has BBCC genome, *O. alta* Swallen, and *O. latifolia* Desv., CCDD genome, and *O.longiglumis* Jansen, and *O. ridleyi* Hook. f., HHJJ genome; and *O. punctata* Kotschy ex Steud., consists of diploid and tetraploid types having BB and BBCC genomes respectively (Vaughan, 1994; Organisation for Economic Co-operation Development, 1999). *Oryza sativa* has a relatively small (430 million base pairs) diploid genome (2n = 24). This is the smallest genome of all food crops and approximately 50% of the genome is made of repetitive

sequences (Chang, 2003). The *O. sativa* complex species have AA-type genomes and are found throughout the tropics. There is a continuum of morphological types from annual to perennial as a result of their adaptation to different ecological niches. Intermediate varieties flower more than once during a season but do not live for more than one season (*The Biology and Ecology of Rice (Oryza sativa) in Australia*, Department of Health and Ageing, 2005).

According to McDonald (1979) and Organisation for Economic Co-operation Development (1999), *Oryza,* which is commonly called rice, is a typical grass, forming a fibrous root system bearing erect culms and developing long flat leaves. It has a semi-aquatic life-style, requiring water particularly during the reproductive growth phase. It forms multiple tillers, consisting of a culm and leaves, with or without a panicle. The panicle emerges on the uppermost node of a culm, from within a flag-leaf sheath and bears the flowers in spikelets. The culm consists of a number of solid nodes and hollow internodes that increase in length and decrease in diameter up the length of the culm. Primary tillers emerge from nodes near the base of the main culm and secondary and tertiary tillers emerge sequentially from the primary tillers. Single leaves develop alternately on the culm, consisting of a sheath, which encloses the culm, and a flat leaf blade. The leaf forms a collar or junctura between the sheath and blade. A ligule and two auricles develop on the inside of the junctura and base of the leaf blade respectively. Cultivars can vary widely in the length, width, colour and pubescence of the leaves.

The panicle emerges from the flag-leaf sheath and consists of a central rachis with up to four primary branches at each node. Primary and secondary branches bear the flower spikelets. Each spikelet has a single floret and two glumes. It is enclosed by a rigid, keeled

lemma, which is sometimes extended to form an awn, and partly envelops the smaller palea. The floret contains six stamens and a single plumose ovary with two branches. At anthesis, two lodicules at the base of the floret swell and force the lemma and palea apart as the stamens elongate and emerge. The stigma is sometimes exposed as well.

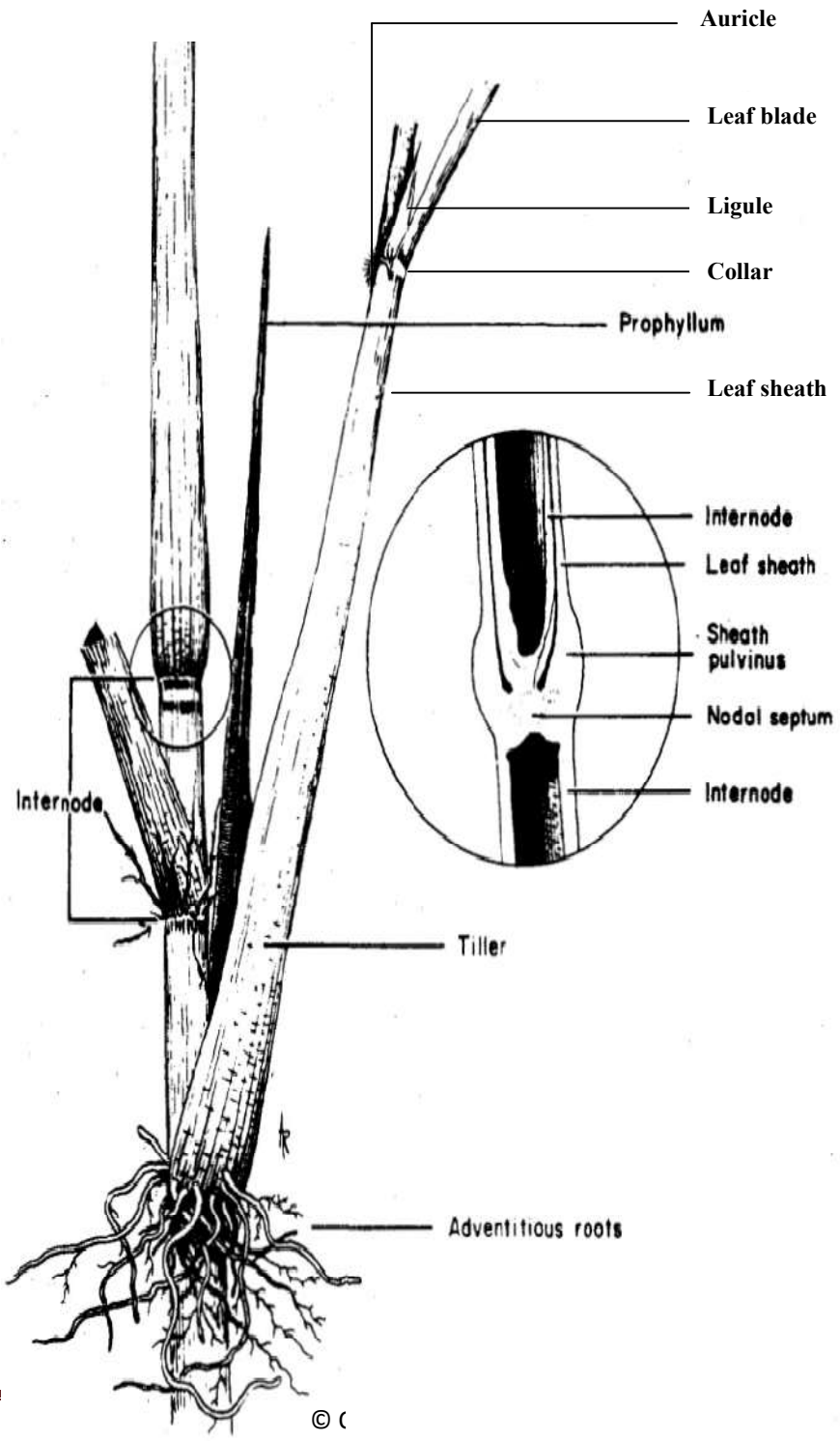

Diagram Showing Parts of a Primary Tiller and its Secondary Tiller (Source: Chang *et al.*, 1964).