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(Received : December 1993 Revised: September 1995)

Madras Agric. J., 83(1): 46-48 January 1996
https://doi.org/10.29321/MAJ.10.A00966

SEED COAT SCLEREIDS IN CERTAIN PULSES

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Abstract

Sclereids present in the seed coats of various members belonging to the family *Leguminosae* have been investigated. With microtome sections and macerations of the seed coats, the type of sclereids and their arrangement have been studied. Macrosclereids and osteosclereids were noticed in all cases. These sclereids were arranged in compact manner in one or two layers below the epidermis of seed coat.

KEY WORDS : Sclereids, Seed Coat, Legumes

One of the most characteristic features of the leguminous seed is the presence of one or two layers of sclereids in the testa. The hardness of the seed coat is due to the presence of sclereids. The seed coat sclereids occur in a single or double layer especially as palisade layer. The structural features of seed coat of papilionaceous seed was well documented by Corner (1951). These studies dealt with the surface characters of seeds and the nature of hilum as well as the sclereids in different layers of the seed coat. Chowdhury and Buth (1970) made statistical analysis of height of palisade sclereids in the seed coats of certain Papilionaceae and they prepared a key for the identification of Indian pulses with the aid of seed structure. The distribution pattern, the nature and structure of sclereids of different layers if present will have a great taxonomic value. The aim of present investigation is to find out the nature, type, structure, frequency and pattern of distribution of sclereids in certain members of pulses.

MATERIALS AND METHODS

The seed coats of the following were investigated in the present study. *Cajanus cajan* L., Millsp.(QUS 7), *Cicer arietinum* L. (CO 1). *Cyamopsis tetragonolobus* L. (CO.1). *Dolichos biflorus* L.(CO.1). *Lab-lab* L.*(typicus)* *Vigna mungo* (Linn) Hepper (ADT 5), *Vigna radiata* (L.) (CO.1). *Pisum sativum* L. var. arvense,*Sesbania grandiflora* Pers., *Trigonella foenumgraecum* L. Nagauri and *Vigna unguiculata* L. Walp (CO 4). For studying the distubution pattern of sclereids, microtome slides were prepared for all the materials mentioned above. Mature seeds were immersed in water for swelling. The seed coats were then removed and fixed in F.A.A. Dehydration in isopropylalcohol was followed by embedding in paraffin wax. Sections were cut at 15-25 μ thickness and were stained with safranin-fast green (Johansen, 1940). In addition to microtome slides, observations on macerated

Table 1. Variation in sclereids in pulses

Crop	Palisade	Height of palisade cells	Nature of cell end away from cuticle	Osteosclereid	Mesophyll cell
Cajannus cajan (QUS 7)	single layer cells filled with tannin and oil drops	75 m.µ	bulbous	branched	-
Cicer arietinum (CO 1)	single layer	110 - 160 m µ	corrugated	2-3 types isodimetric or with stellate end	-
Cyamopsis tetragonalobus (CO 1)	single layer walls have uniform thickness	90 - 100 m µ	bulbous	different types	variations seen
Dolichos biflorus (CO 1)	single layer cells with uniform thickness	75 m µ	bulbous lobed in few	thick walled ovately spherical sclereids with much reduced lumen	variety of forms
Lab lab (typicus)	single layer highly elongated sclereids	80 m µ	swollen at base	stellate ends	size and shape vary widely
Vigna mungo (ADT 5)	single layer of columnar sclereids	65 m µ	bulbous	spherical cells with centrally located triangular slit like lumen	with contents
Vigna radiata (CO 1)	single layer	65 m µ	distinctly corrugated	no marked variation	thick walled with dense contents
Sesbania grandiflora	single layer	80 m µ	slightly bulged	evenly thickened	heavily thickened with dense contents
Trigonella foenum graecum (Nagauri)	single layer of compactly arranged cells	75 m µ	slightly swollen	uniformly thickened wall throughout with contents	heavily thickened with dense contents
Vigna unguiculata (CO 4)	single layer of compactly arranged cells	70 m µ	bulbous heavily thickened	stellate end	thin walled

materials of the seed coats (in Jefrey's fluid) of all the above members were made.

RESULTS AND DISCUSSION

The seed coats of all the investigated plants possess the following basic structural details. Usually the seed coat is divisible into three zones of which two are invariably transformed into sclereid layers. The outermost layer consists of closely packed cloumnar cells and develop from the protoderm of developing seed which elongate at right angles to the surface. The cells of this layer transform themselves into macrosclereids and are covered on their outer surface by a very thick cuticle. Adjacent to hilum, there are two to three layers of such cells. Because of their elongated nature, the cells are known as palisade. The next inner layer is made up of hour glass shaped cells. The next zone consists of layers of cells of smaller

In palisade layer, the cell end away from cuticle is distinctly corrugated in *P.sativum* and *C.arietinum,* swollen in *I.foenum graecum* (Nagauri.) *S.grandiflora, Lab lab* (typicus) and bulbous in rest. The osteosclereid is bone shaped in *V.radiata* ovately spherical with much reduced lumen in *D.biflorus,* spherical with centrally located triangular slit like lumen in *V.mungo* and branched in *C.cajan* Mesophyll cells are thin walled with contents filling the entire cell cavity in *P.radiatus,* thick walled with dense contents in *Pisum sativum* and heavily thickened with dense contents in *S.grandiflora* and *I.foenum graecum.*. The three major types of macrosclerids recognised by Chowdhury and Buth (1970) were found in this study also. However, a few plants like *C.cajan* showed some osteosclereids also in the palisade tissue. The most significant observation made in this work is the occurrence of sclereids of a variety zone' and the mesophyll. They range from spherical brachy sclereid like forms to highly branched trichosclereid like ones. They varied greatly in their size and cell wall thickness. Some have very thin secondary walls while other had thick walls. In some cases filled with ergastic inclusions like tannin (Table 1).

It is interesting to note that within the same seed coat, the various layers behave in different ways during ontogeny to result in varied types of sclereids. It is not well understood, the mechanism involved in leguminous seeds which differentiate the layers of sclereids.

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(Received : February 1990 Revised : December 1995)

Madras Agric. J., 83(1): 48-50 January 1996

UREA HYDROLYSIS UNDER FLOODED CONDITION

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ABSTRACT

A laboratory experiment was conduced to study the hydrolysis of urea, using NK granule and ureagypsum in texturally varied rice soils. The results revealed that in clay loam soil, the hydrolysis of urea increased upto 3 days and decreased from 7th day onwards while, the peak of 4th and 5th day for urea gypsum, gaining a delay of 2 days. In sandy loam soil, the dydrolysis peak was on 7th and 9th day for urea and ureagypsum respectively.

KEY WORDS : Urea, Hydrolysis, Flooded Conditions

Urea hydrolysis is a biochemical reaction mediated by urease enzyme yielding ammonium carbonate which dissociates into NH_3 and CO_2. The hydrolysis is influenced by many factors like enzyme activity, concentration of the substrate and soil characteristics and the pattern of hydrolysis is measured in terms of unhydrolysed urea or amounts of inorganic nitrogen hydrolysed at specific period of time. It would be advantageous to control urea hydrolysis of flooded soils since this would decrease N loss due to NH_3 volatilisation and probably through other ways. The controlled release of urea based fertilizers or formulation with ureas inhibitors are the two approaches mostly suggested for slowing down the urea a hydrolysis. In the present investigation urea, NK granules and urea gypsum were used for hydrolysis study under flooded situation.

MATERIALS AND METHODS

win (Entic chromustert) and Madukkur soil series (Typic haplustalf) were taken up for the study. The basic properties of the soils are presented in Table 1. Ten g of air dried soil was incubated for 15 days with 60 ppm of nitrogen using three sources *viz.*, prilled urea (46% N), ureagypsum (21% N) and NK granules (20% N). The incubation was carried out at room temperatures and the soils were maintained at submergencs (2.5 cm) throughout the experimental period. The laboratory experiment

Table 1. Basic soil Characteristics

Soil properties	Adanur series	Madukkur series
Textural class	Clayloam	Sandy loam
Taxonomy	Entic chromustert	Udic haplustalf
Total N (Per cent)	0.102	0.085
Organic carbon (Per cent)	0.81	0.66
Available N (kg ha^{-1})	270	210
Exchangeable NH_4-N (ppm)	34.0	24.8
NO_3- (ppm)	1.08	1.20