J. Phytol. Res. **8** (2): 129-132, 1995

CHANGES IN MEMBRANE PERMEABILITY DURING IMBIBITION

RUPAM TALWAR and S. DUA*
Department of Botany, University of Delhi, Delhi-110007, India.
*Panjab University, Chandigarh-160014, India.

Imbibing seeds of *Carthamus tinctorius* cv Bhima and *Sesamum indicum* cv TC-289 in water resulted in rapid initial water uptake and rapid leaching of solutes and ions. Later the rate of water uptake by seeds and leaching of solutes in the imbibition medium decreased. This appears to be due to changes in memberane permeability.
Keywords : *Carthamus tinctorius;* Imbibition; Leaching Membrane permeability; *Sesamum indicum.*

Introduction

The imbibition of water changes the seed from a quiescent body with a very low respiratory rate to a dynamic structure active in respiration, biosynthesis and growth.[1] The dry seeds have porous membranes due to the absence of sufficient water to maintain a hydrophillic/hydrophobic orientation of lipids in membranes.[2] Present investigation was carried out in order to study the changes in the electric conductivity of imbibition medium and composition of leachates to asses the membrane integrity during imbibition in *Carthamus tinctorius* (safflower) and *Sesamum indicum* (sesame) seeds.

Materials and Methods

Pure line seeds of *Carthamus tinctorius* cv Bhima and *Sesamum indicum* cv TC-289 were obtained from Punjab Agricultural University, Ludhiana (India). 5g of the uniform, viable and healthy seeds were selected and soaked in 50ml of distilled water. Seeds were imbibed for varying periods viz 4, 8, 12, 16, 20 and 24h. At each time interval, the change in volume of the medium and weight of the soaked seeds after imbibition was noted.

Colorimetric estimations of water-soluble protiens and water-soluble carbohydrates were done by using standard techniques.[3,4] Electric conductivity of medium at room temperature was measured using digital conductivity meter.

α-amylase (EC 3.2.1.1), β-amylase (EC 3.2.1.2) and Protease (EC 3.4.4.1) activity were determined by using methods of Bernfeld[5], Dure[6], Basha and Beevers[7] respectively.

Results and Discussion

Water uptake by the dry seeds was monitored as the increase in their fresh weight (Fig 1). The pattern of water uptake for these seeds was characteristic of physiologically non dormant seeds.[8]

Analysis of the imbibition medium indicated the leakage of water-soluble protiens, sugars and enzymes into it. The concentration of leachates was high from 8h to 20h of imbibition. later the leaching biomolecules in the medium decreased (Fig 2,3). Simon[2], also observed the rapid leakage of solutes from pea seeds during an initial 10 min-period. Hendricks and Taylorson[9] have noted the same phenomenon in seeds of several species.

In the first few hours, the in rush of water is accompanied by a very rapid loss of

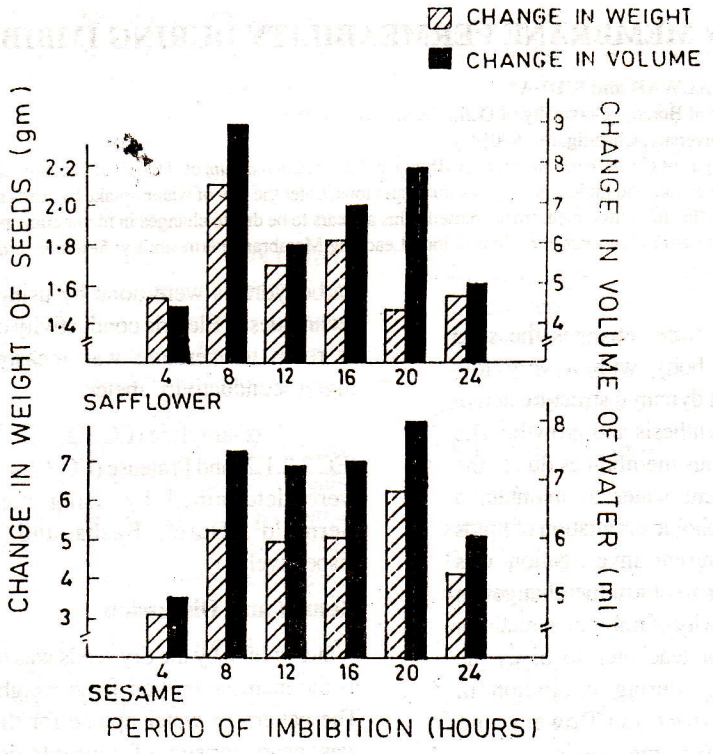

Fig.1. Change in weight of seeds (g, on fresh weight basis) and volume (ml) of water during different periods of imbibition in water.

solutes from the cells. It suggests that with the initiation of water uptake, there is a change in the membrane permeability of these seeds which leads to the leakage of biomolecules.

Initially, the membranes of seeds are rather leaky, but the leakiness is very rapidly repaired during imbibition[10]. The cell membranes reorganize from a presumably porous condition into effective semipermeable barrier and functional units[2,11]. Huang and Fu[12] reported increase in mitochondrial, plasma membrane and tonoplast ATPase activity accompanying imbibition. Such membrane rearrangement appears to involve not only a decrease in leakiness but also a decrease in rate of imbibition of water.[13]

Acknowledgements

The Authors are thankful to C.S.I.R., New Delhi for financial assistance and Prof. K.G. Mukerji for going through the manuscript and making valuble suggestions.

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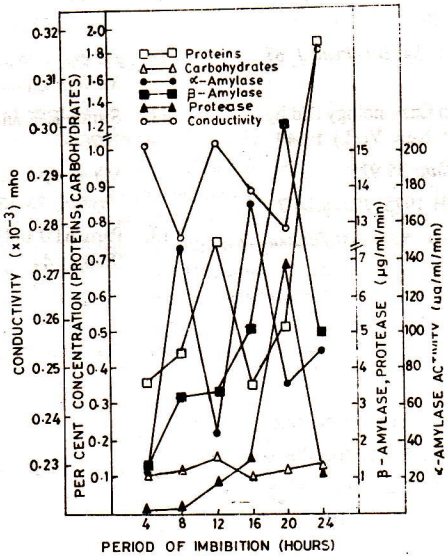

Fig.2. Changes in proteins and carbohydrates, (% on fresh weight basis). α-amylase, β-amylase and protease activity (μg/ml/min) and conductivity (x10^{-3} mho) in imbibition medium of Safflower seeds during different periods of imbibition.

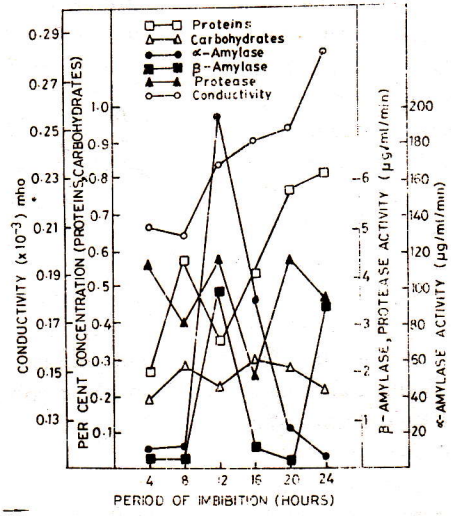

Fig.3. Changes in proteins and carbohydrates, (% on fresh weight basis). α-amylase, β-amylase and protease activity (μg/ml/min) and conductivity (x10^{-3} mho) in imbition medium of Sesame seeds during different preiods of imbibition.

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