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Seed Quality Testing of Native Species

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Content

- Importance of Seed Quality Testing
- Quality Testing Techniques
- Findings
- Recommendations

Seed

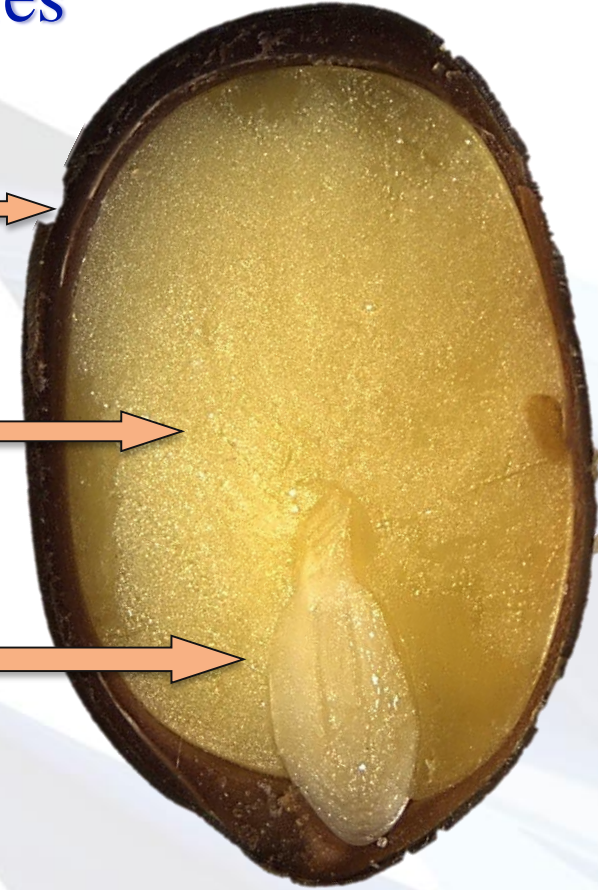
- A biological component of a plant
- Responsible for sustaining the genera of species



Seed Structure

A healthy seed comprises of three major structures

- A protective seed coat
- Supporting nutritive tissues/Cotyledons
- Embryo



Importance of Quality Seeds

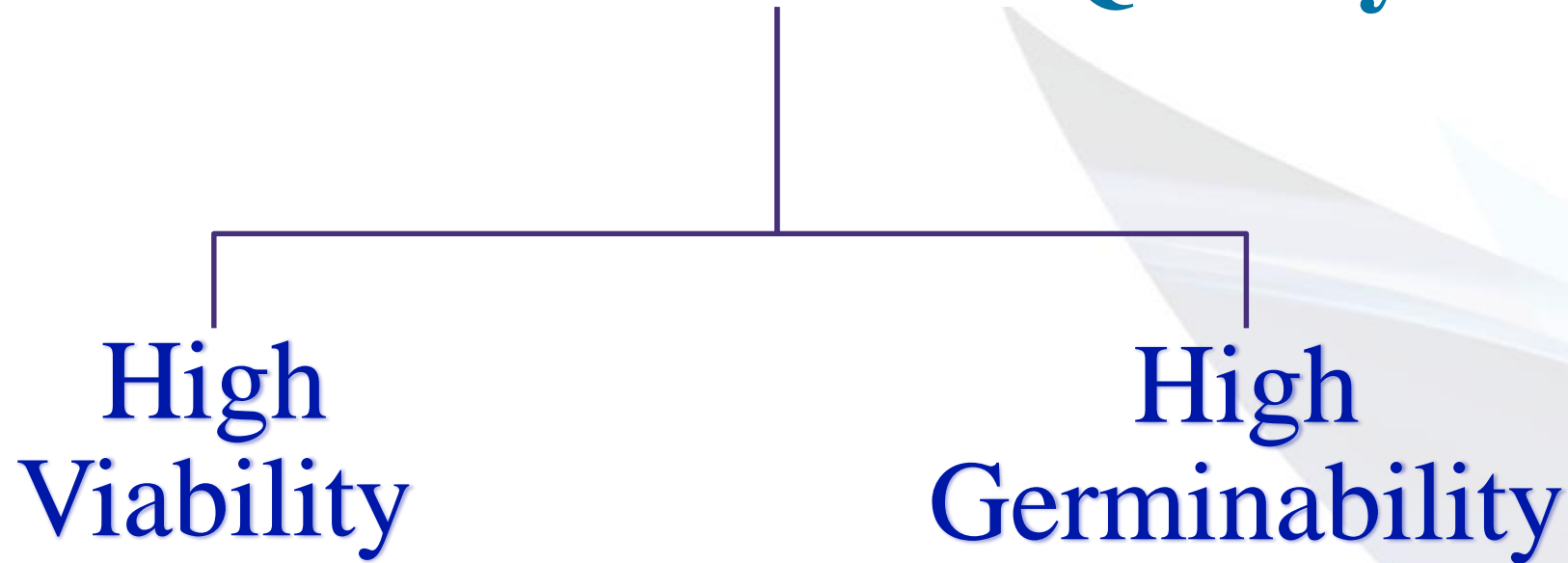
Quality seeds can ensure maximum production of

- Genetically pure
- True to type
- Resistant
- Healthy
- Well-adapted crops

Crop that will be capable to grow

- Rapidly
- Vigorously
- Uniformly and
- Minimal maintenance.

Prime Characteristics of Quality Seeds



Seed Viability

A seed can be considered viable if it is alive when subjected to any viability test and capable of reproducing themselves in an appropriate growing condition (Gosling, 2001).



Factors Affecting Seed Viability

Seed Coat

Moisture Content

Harvesting Conditions

Oxygen Pressure

Attack of Microbes, Rodents, Insects and Mites

External Environmental Conditions

Internal Seed Conditions

Germinability

It is the capability of a viable seed to grow into a healthy seedling under optimum growing conditions such as

- Temperature
- Moisture
- Aeration
- Light

Dormancy

A resting condition of a seed in the absence of optimum germination conditions, is termed as Dormancy.

A dormant seed may be viable but certain factors (physical or chemicals) prevent it from germination.

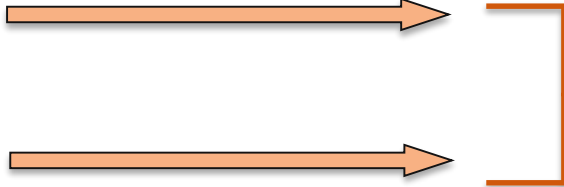
To retrieve a dormant seed, the factor leading the seed to dormancy has to be identified and precise pre-treatments need to be administered.

Viability Testing

To confirm if the seed is viable or not and is capable of germinating at the return of optimal condition, the seeds needs to undergo Viability Testing.

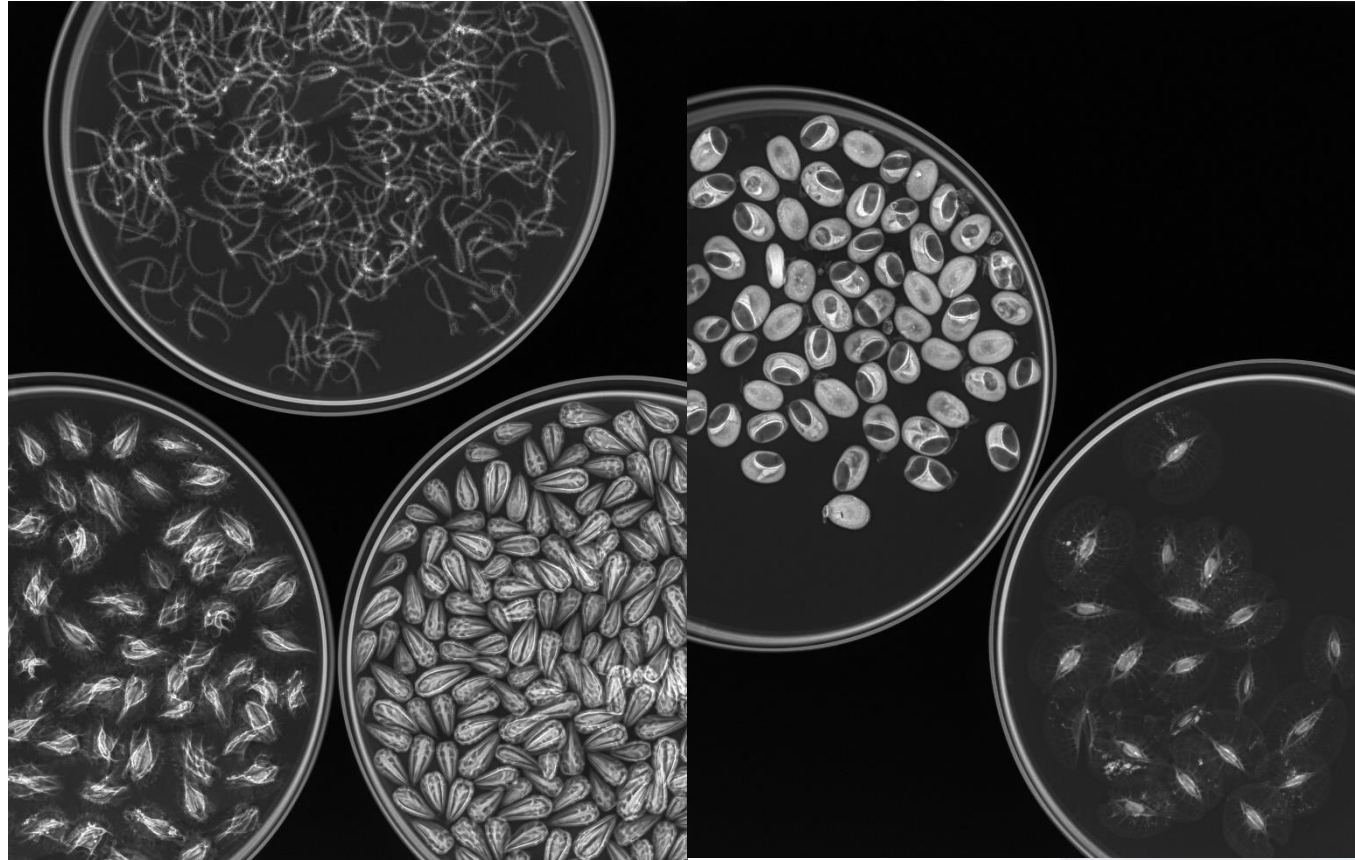
Viability Testing Techniques

Among various viability testing techniques a few which are commonly used are

- Germination Test → • Suitable for Non-Dormant seeds
 - Cut test →
 - Excised embryo test →
 - TTC testing → • Prior to test the dormancy should be broken
 - X-radiography → • Exhibit seed filling, deformation and infestation ONLY
- 

(Source: Gosling, 2001; Hampton, 1995; ISTA, 2007).

Viability Testing Techniques



X-radiography

Native Plant Species

Utilization of native plant species in a restoration and re-vegetation program is the most advantageous choice.

- Well adapted to the native climatic conditions
- Promotes conservation of the Regional Heritage



Hindrance

Lack of Literature on the seed morphology, physiology and the handling measures of native species of Kuwait

Germination Test

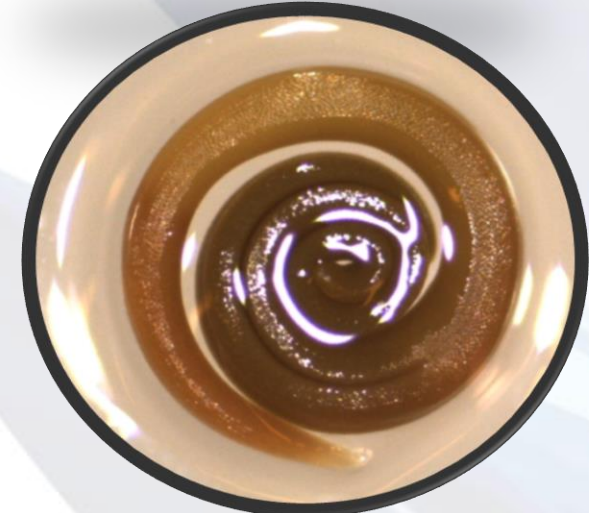
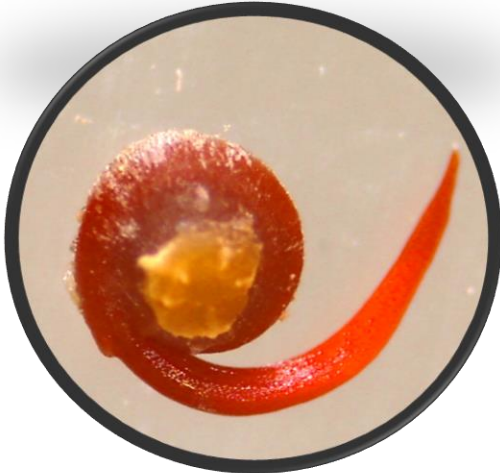
Haloxylon salicornium



Halothamnus iraqensis

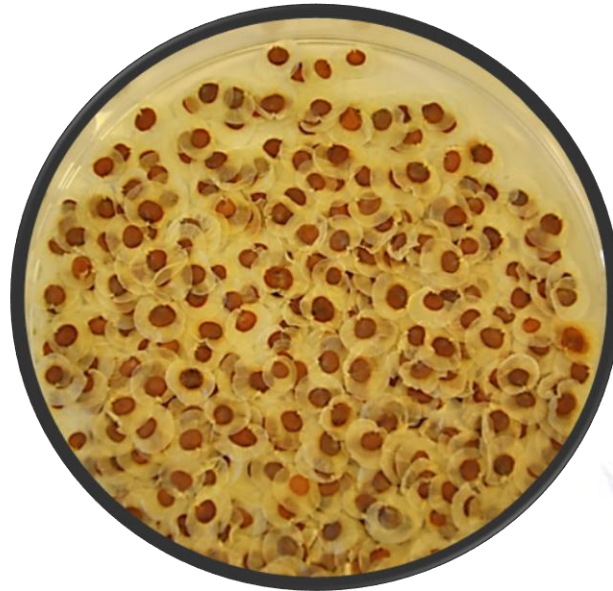
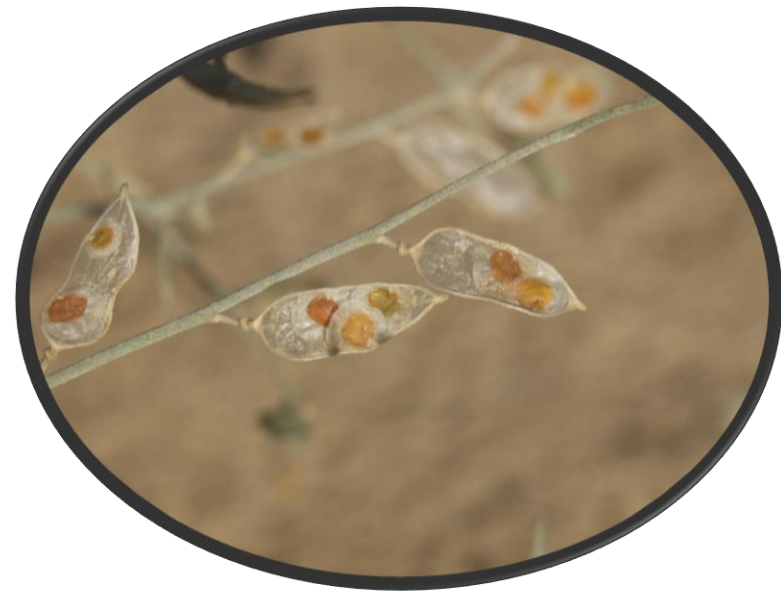


Salsola imbricata



Germination Test

Farsetia aegyptia



Tetrazolium Chloride Test (TTC)

- Most common techniques used for non-dormant and dormant species.
- The colorless chemical reacts with the respiratory enzymes (dehydrogenase) released by the live tissues of the seed staining them red.
- Non-viable seeds do not respire so no reaction happens hence, no staining occurs.

Method

- Embryo exposed
- Treated with the TTC solution.
- Incubated at room temp overnight
- Number of stained seeds against the non-stained ones determines the viability percentage (Ramos et al., 2012).

Tetrazolium Chloride Test (TTC)

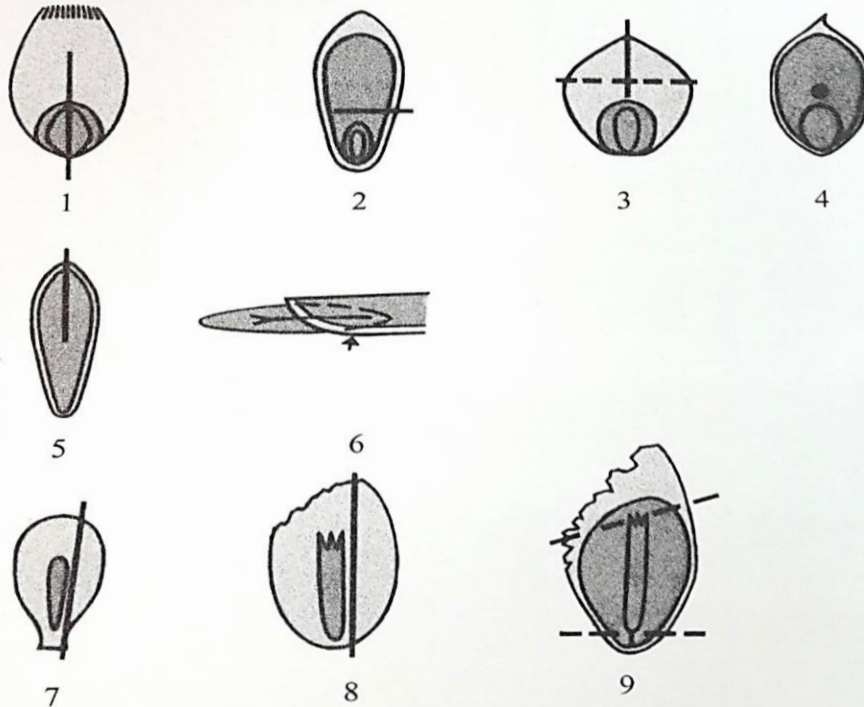
International Rules for Seed Testing

Effective from 1st January 2007

Figure 6.1 Preparation Procedure

The figures show the position of different cuts for preparation before staining.

1. Longitudinal bisection through embryo and approximately $\frac{1}{4}$ of the endosperm of cereals and grass seeds.
2. Transverse cut - a transverse incision near embryo (*Avena* and grass seeds).
3. Transverse cut (dotted line) and longitudinal incision through distal part of the endosperm of grass seeds.
4. Piercing through endosperm of grass seeds.
5. Longitudinal cut through distal half of cotyledons, i.e. seeds of *Lactuca* and others of the *Asteraceae* (*Compositae*).
6. Longitudinal section showing the position of the scalpel when making a cut like 5.
7. Longitudinal cut alongside the embryo. (Species of *Apiaceae* (*Umbelliferae*) and other species with a straight embryo).
8. Longitudinal cut alongside the embryo of coniferous seeds.
9. Transverse cut at both ends to open embryo cavity and remove fractions of endosperm (gametophyte tissue).



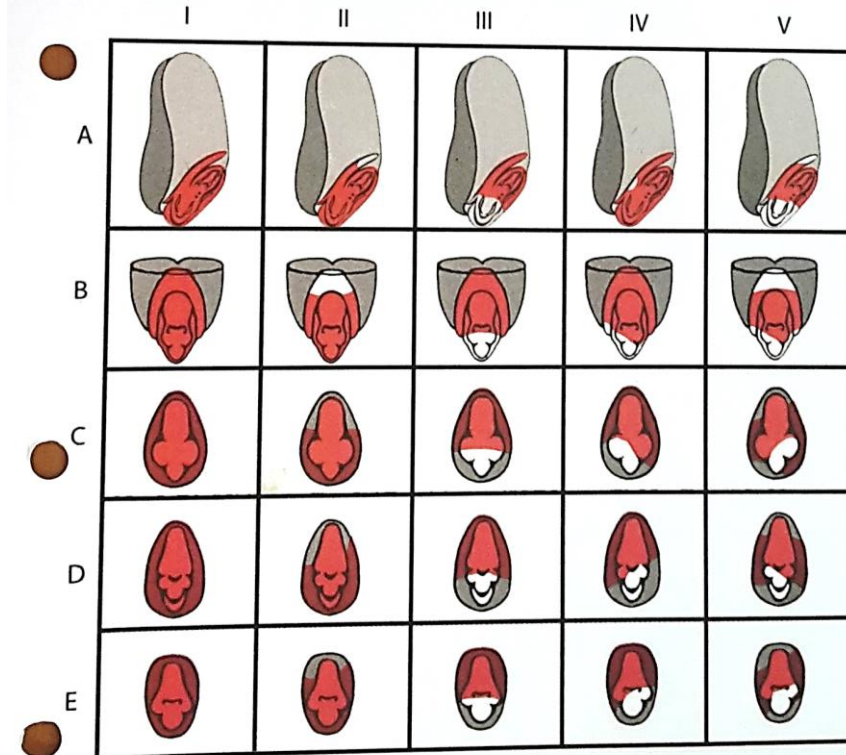
International Rules for Seed Testing

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Figure 6.2 Evaluation Procedure for Cereals

The figures in the first column are all completely stained and viable. The other figures show the maximum area of unstained, flaccid or necrotic tissue permitted in viable seeds, except Figure IV.A, which shows a seed non-viable because of unstained (necrotic) tissue at the centre of the scutellum indicative of heat damage:

- A: The figures are representative for *Triticum*, *Secale*, *Hordeum*, and *Avena* when prepared by bisection or bisected for evaluation.
 B: *Avena* prepared by transverse cutting.
 C: *Hordeum* prepared by excised embryo method.
 D: *Secale* prepared by excised embryo method.
 E: *Triticum* prepared by excised embryo method.

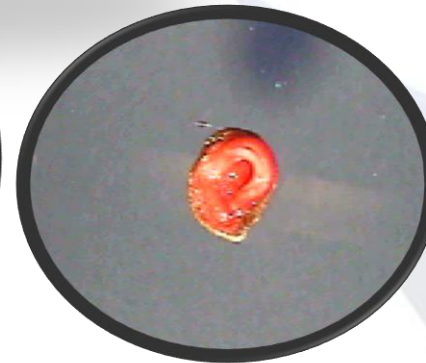


Tetrazolium Chloride Test (TTC)

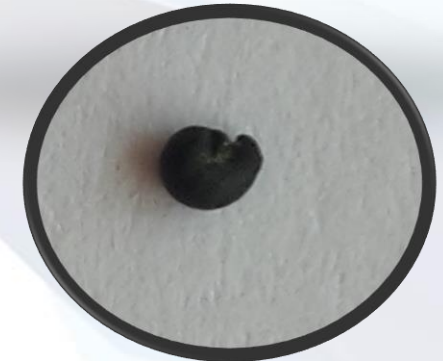
Nitraria retusa



Lycium shawii

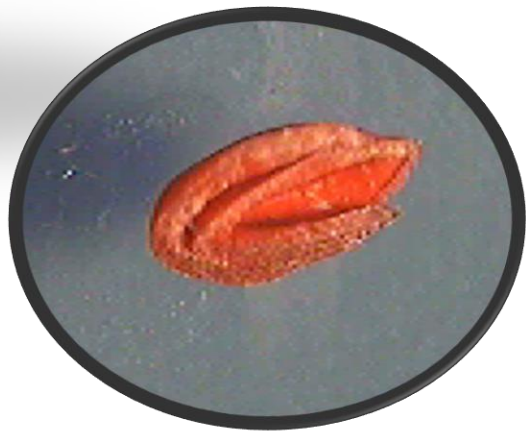


Ochradenus baccatus

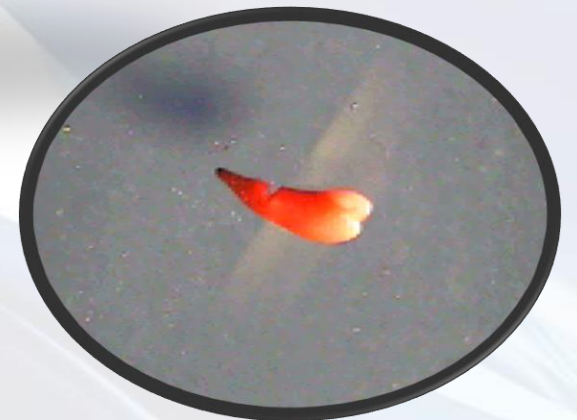


Tetrazolium Chloride Test (TTC)

Horwoodia dicksoniae



Rhanterium epapposum



Tetrazolium Chloride Test (TTC)

Acacia pachyceras

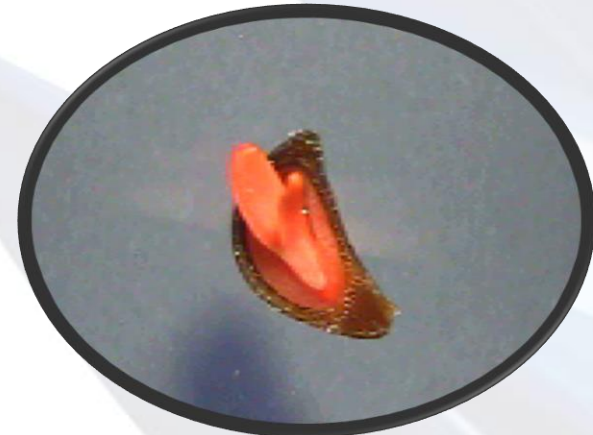
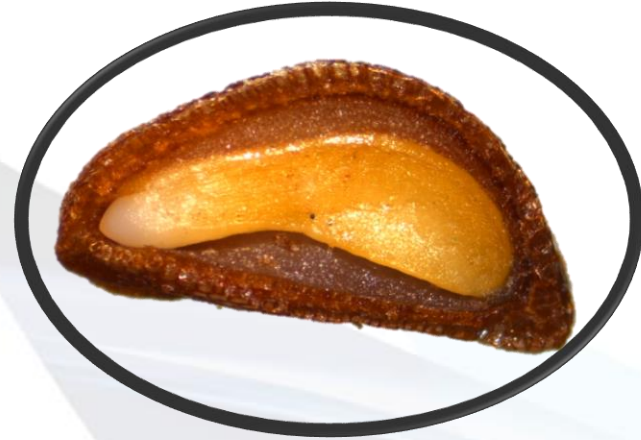


Convolvulus oxyphyllus



Tetrazolium Chloride Test (TTC)

Peganum harmala



Conclusion

These are the preliminary findings of viability tests.

Adequate data on areas of practical knowledge is not available.

These procedures have to be standardized to determine

- Pre-moistening time
- TTC concentration
- Duration of soaking for TTC

However, this information will be highly useful for researchers involved in the quality testing of native plants of Kuwait.



Thank You

