



Establishment of Tetrazolium Test Procedure of Papaya (*Carica papaya* L.) Seed

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Introduction

Papaya (*Carica papaya* L.) is an important fruit crop and the main kind of fruit seed exportation from Taiwan. But the tetrazolium test of papaya seed is not included in the International Seed Testing Rules. This study tested the tetrazolium (TTC) testing conditions of papaya seed to quickly estimate seed viability.

Material and Methods

(1) Establishment of Tetrazolium Test Procedure We checked the staining different papaya seed tetrazolium testing procedures including different **A.** Premoistening durations (18, 24 and 48 hours), **B.** Staining solution concentrations (0.5 and 1.0%) and **C.** Staining durations (3, 4, 5 and 6 hours).

(2) Evaluation of Viable and Non-viable Tissue Seven papaya seed lots have been evaluated by studying staining patterns and tissue soundness and separated seeds into to different staining types to compare them with germination. The Root Mean Square (RMS) is also be calculated to find the best combination of staining types that can indicate seeds with good germination.

$$RMS = \sqrt{\frac{(G_1 - P_1)^2 + (G_2 - P_2)^2 + \dots + (G_n - P_n)^2}{N}}$$

G_i : the germination rate of seed lot i

P_i : the permitted viable seeds of seed lot i

N : total amount of seed lots

Result and Discussion

(1) Establishment of Tetrazolium Test Procedure

A. Premoistening duration The result shows the effect of extending the premoistening duration from 18 to 48 hours on viable seed evaluation is not significant (Table 1).

Table 1. Comparison of viable seeds percentage of papaya seed with different premoistening durations.

Premoistening duration (hours)	Viable seeds (%)
18	86 a
24	78 a
48	72 a

Significance Level: 0.05

B. Staining solution concentration There was no statistics difference between two different staining solution concentration (0.5% and 1 %) on viable seeds permitting of two papaya seed lots with different seed vigor (Table 2).

Table 2. Comparison of viable seeds percentage of papaya seed with different staining solution concentrations.

TTC Concentration (%)	Viable seeds (%)	
	Lot 1	Lot 2
0.5 %	78.3 a	35.0 a
1.0 %	75.0 a	30.0 a

Significance Level: 0.05

C. Staining duration Extending the staining duration from 3 to 6 hours shows no significant difference on permitted viable papaya seeds (Table 3).

Table 3. Comparison of viable seeds percentage of papaya seed with different staining durations.

Staining duration (hours)	Viable seeds (%)
3	86 a
4	79 a
5	79 a
6	82 a

Significance Level: 0.05

(2) Evaluation of Viable and Non-viable Tissue

Six staining types were separated by different staining patterns of seven papaya seed lots in this study (Figure.1) and calculated the RMS with germination rates. The result shows the combination of staining types 1, 2 and 3 calculated the lowest RMS of 3.83 (data not shown) indicating the combination meet the seed germination rate (Table 4).

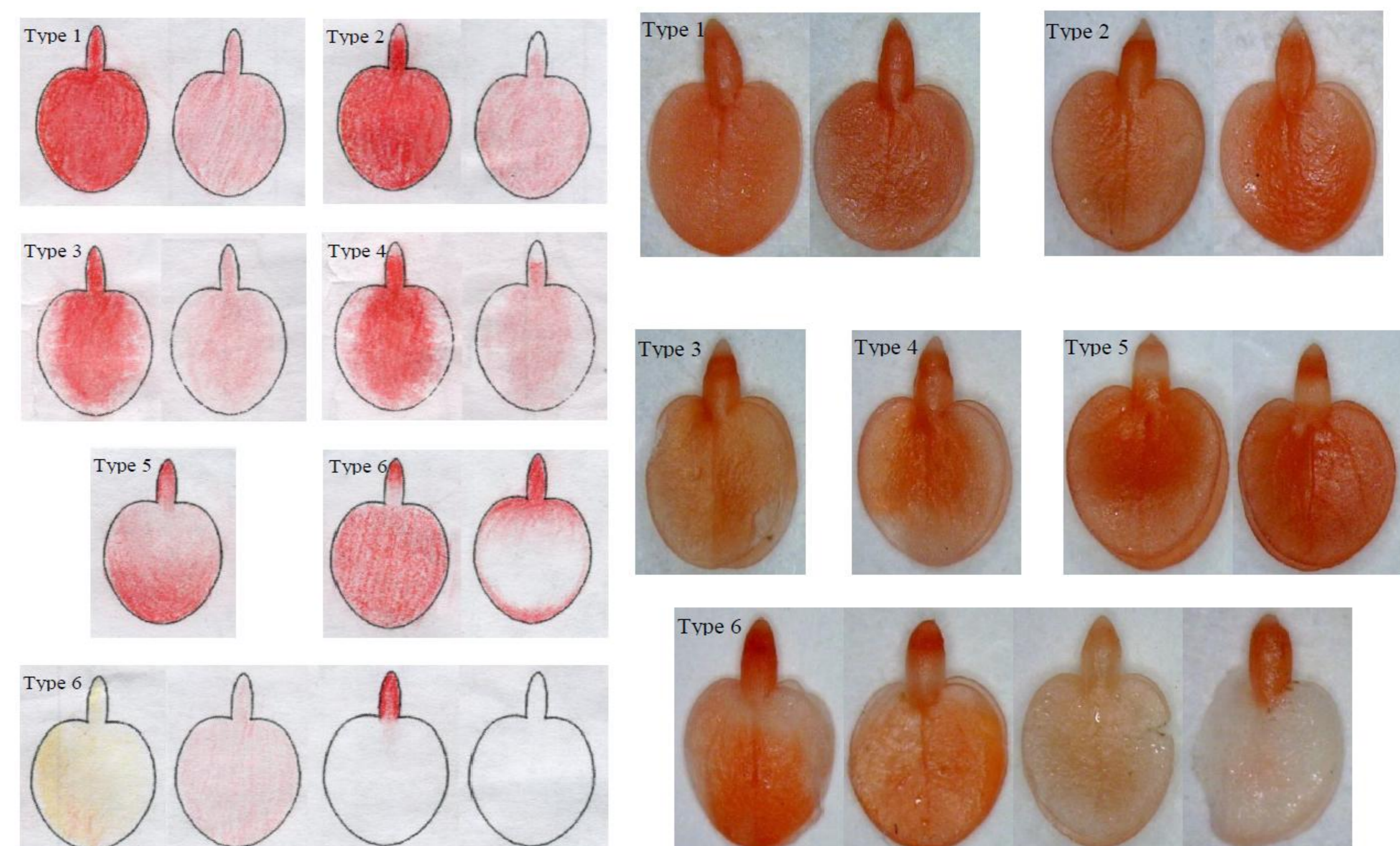


Figure 1. The TTC staining types of papaya seed.

Table 4. Comparison of TTC permitted viability and germination rate of papaya seeds.

Staining Type	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6	Lot 7
Type 1	17.0	68.5	58.5	20.5	41.0	69.0	77.0
Type 2	11.5	11.5	21.5	18.5	29.0	12.5	10.5
Type 3	3.5	4.0	1.0	3.0	3.5	7.0	1.5
Type 4	4.0	0	1.0	1.0	1.0	3.5	0.5
Type 5	7.5	8.0	1.5	11.0	0.5	0	2.5
Type 6	56.5	8.0	16.5	46.0	25.0	8.0	8.0
Permitted Viability (%)	32.0a^z	84.0a	81.0a	42.0a	73.5a	88.5a	89.0b
Germination Rate (%)	33.3a	84.8a	75.0a	40.5a	76.3a	85.0a	95.5a

^z Means within the same letters in a column are not significantly different by Fisher's LSD test at 5% level.

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