

## TARC Note

### Application of Tes-Tape Method to Examine Viability of Stored Legume Seeds

A seed exudate method to examine seed viability without conducting germination test was proposed by Takayanagi and Murakami (1968).<sup>2)</sup> This method was applied to test vigor of legume seeds which were produced in Thailand, Indonesia, and India and stored at 7-10°C for 2 to 14 years at the Tropical Agriculture Research Center. Information on conditions of seed harvesting in each country was not available, except that all these seed samples were kept in refrigerators after harvesting.

Twenty legume seeds were soaked in 4 ml of sterilized water and incubated at 30°C for 12 hr. After the incubation, glucose exudated from the seeds was determined by utilizing the Tes-tape (a testing paper to

detect glucose in urine. SHIONOGI Seiyaku and ELILILLY U.S.A.). In addition, a refractometer was also used to determine glucose content of the seed exudate.

On the other hand, the usual germination test was carried out to know the relation between the seed vigor determined by the Tes-tape method and germination percentage. A set of 3 plots (20 seeds used for each plot) for each seed sample was incubated at 30°C in the dark. The germination rate reached more than 75% of the full germinability on the third day after soaking.

The results are shown in Tables 1 and 2. When the Tes-tape reaction was negative (0), the seeds were regarded vigorous. A change in the color of Tes-tape from yellow to light green (index 0.1 to 0.25) showed weak vigor of seeds. The color change to green (index 0.5) indicated that the seeds lost their germinability. It was also found that the refraction

Table 1. Germination percentage of legume seeds stored for different periods of time

| Legume seed        | Year of harvest | Country   | Germination |
|--------------------|-----------------|-----------|-------------|
| Green gram (G)*    | 1971            | Indonesia | 95%         |
| Cow pea (Br)       | 1971            | Indonesia | 80          |
| Cow pea (Br)       | 1971            | Indonesia | 90          |
| Cow pea (Gr)       | 1971            | Indonesia | 15          |
| Hyacinth bean (Gr) | 1971            | Indonesia | 75          |
| Hyacinth bean (Br) | 1971            | Indonesia | 85          |
| Hyacinth bean (Br) | 1971            | Indonesia | 85          |
| Pigeon pea (Gr)    | 1971            | Indonesia | 0           |
| Sword bean (W)     | 1971            | Indonesia | 90          |
| Sword bean (Br)    | 1971            | Indonesia | 5           |
| Pigeon pea (Br)    | 1979            | India     | 95          |
| Pigeon pea (Br)    | 1979            | India     | 100         |
| Cluster bean (Gr)  | 1979            | India     | 100         |
| Green gram (Gr)    | 1979            | India     | 100         |
| Khesari (Gr)       | 1979            | India     | 80          |
| Yam bean (Br)      | 1979            | Thailand  | 15          |
| Lentil (Gr)        | 1979            | India     | 85          |
| Chick pea (Gr)     | 1981            | India     | 100         |
| Rice bean (Br)     | 1983            | Thailand  | 100         |

Germination percentage at 30°C, 72 hr after soaking: Mean of 3 plots (20 seeds used for each plot)

\* Seed coat color (G): Green, (Br): Brown, (Gr): Gray, (W): White

Table 2. Reaction of Tes-tape to seed exudate and refraction index of seed exudate after 12 hr soaking of 20 seeds in 4 ml of water at 30°C

| Legume seeds |       | Percentage of germination | Tes-tape index % | Refraction index % |
|--------------|-------|---------------------------|------------------|--------------------|
| Cow pea      | (Br)* | 90                        | 0                | 0.5                |
| Cow pea      | (Gr)  | 15                        | 0.25             | 1.1                |
| Pigeon pea   | (Br)  | 100                       | 0                | 0.8                |
| Pigeon pea   | (Gr)  | 0                         | 0.5              | 2.5                |
| Sword bean   | (W)   | 90                        | 0                | 0.1                |
| Sword bean   | (Br)  | 5                         | 0.25             | 1.0                |
| Yam bean     | (Br)  | 15                        | 0.1              | 0.8                |

\* Seed coat color (G): Green, (Br): Brown, (Gr): Gray, (W): White

index was related to the germinability, but this parameter was considered to be less reliable than those obtained by the Tes-tape method, because germination rate of 15% and that of 100% were observed at the refractometer index of 0.8.

From these observations it is concluded that there is a significant negative correlation between seed vigor and the amount of glucose in seed exudate. The seed exudate method with Tes-tape is regarded a rapid and sensitive method to examine viability for legume seeds.

It was also recognized that the extent of seeds deterioration caused by long-term storage varied with different seed coat color among seeds of the same crop. Further study is needed on this point.

- 1) Abdul-Baki, A. A. & Anderson, J. D.: Vigor determined in soybean seed by multiple criteria. *Crop. Sci.*, 13, 630-633 (1973).
- 2) Takayanagi, K. & Murakami, K.: Rapid germinability test with exudates from seed. *Nature*, 218, 493-494 (1968).
- 3) Takayanagi, K.: Seed exudate method of testing seed vigor. *Bull. Nat. Inst. Agr. Sci.*, D 28, 281-287 (1977).

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