Resources of South-East Asia. Prosea Foundation, Bogor. No. 9.

Kay, D.E. 1987. Crop and Product Digest. Dalam: E.G.B. Gooding (rev.). *Root Crops*. TDRI, London. 2. pp. 45-50.

Kempthorne, O. 1963. *An Introduction to Genetic Statistics* (2nd printing). John Wiley & Sons, Inc. London. 545p.

Ohtsuki. 1968. Studies on Reserve Carbohydrates of Flour *Amorphophallus* species with Special Reference to Mannan. *Botanical Magazine Tokyo*. 81:119-126.

Roemantyo. 1991. Konservasi *Ex Situ Amorphophallus titanum* Becc. di Kebun Raya Bogor. *Buletin Kebun Raya Indonesia*. 7(2): 45-49.

Singh, R. K. dan B. D. Chaudary. 1979. *Biometrical Methods In Quantitative Genetic Analysis*. Kalyani Publishers. Ludhiana. New Delhi. 296p.

Soemono, S., J.S. Baharsjah, J. Wiroatmojo, dan S. Tjitrosoedirdjo. 1986. Pengaruh bobot bibit terhadap pertumbuhan, hasil dan kualitas umbi suweg (*Amorphophallus campanulatus*) pada berbagai umur. *Buletin Agronomi* XVII (2): 17 – 23.

Sufiani, S. 1993. Iles-iles (*Amorphophallus*):. jenis, syarat tumbuh, budidaya dan standar mutu ekspornya. *Media Komunikasi Penelitian dan Pengembangan Tanaman Industri*. 12:11-16.

Sutjihno dan M.S. Sudjono. 1989. Analisis korelasi dan koefisien lintasan tujuh sifat kedelai menggunakan program regresi berganda. *Penelitian Pertanian*. 9(2) :16-18.

Zahid, A. dan Siregar, A.A.. 1991. *Ilmu Pengetahuan dan Teknologi Tepat Guna*. Kumpulan Tulisan PPPM, IPB. p:26-27.

Ilmu Pertanian, Vol. 8 No. 2, 2001: 62 - 65

VIABILITY TEST OF STORED CORN SEEDS BASED ON THE RELATIONSHIP BETWEEN CONCENTRATION OF INORGANIC EXUDATES AND ELECTRICAL CONDUCTIVITY OF SOAKING WATER

UJI VIABILITAS BENIH JAGUNG BERDASARKAN HUBUNGAN KONSENTRASI EKSUDAT ANORGANIK DENGAN DAYA HANTAR LISTRIK AIR RENDAMAN

T. S. Endang[1], P. Yudono[2], and D. Indradewa[2]

INTISARI

Penelitian ini dilakukan untuk mengetahui hubungan konsentrasi eksudat dengan daya hantar listrik air rendaman benih jagung setelah disimpan dalam rangka uji mutu benihnya. Rancangan Acak Lengkap digunakan untuk perlakuan periode penyimpanan 0, 1, 2, 3, 4 bulan dalam suhu kamar. Ulangan dilakukan tiga kali. Pengamatan dilakukan terhadap konsentrasi eksudat anorganik (nitrogen, fosfor, kalium, kalsium, dan magnesium), daya hantar listrik, daya tumbuh benih, serta bobot basah dan kering bibit.

Hasil penelitian menunjukkan bahwa dengan semakin lamanya penyimpanan, konsentrasi eksudat anorganik meningkat, daya hantar listrik meningkat, tetapi daya tumbuh benih dan bobot bibit menurun. Konsentrasi eksudat memiliki korelasi positif yang nyata terhadap daya hantar listrik dan memiliki korelasi negatif yang nyata terhadap daya tumbuh benih dan bobot bibitnya. Hasil ini memungkinkan penggunaan daya hantar listrik sebagai indikator viabilitas benih dan alternatif cara uji daya tumbuh benih jagung.

Kata kunci: elektrolit, eksudat anorganik, daya hantar listrik, viabilitas benih, jagung.

ABSTRACT

It has been known that deteriorate seeds exudes much ions if soaked in water. This experiment was aimed to assess stored corn seeds viability based on concentration of inorganic exudates and on electrical conductivity (EC) of soaking water of the seeds they generate.

Seeds of zero, one, two, three, and four months in storage were soaked in water. The soaking water then was observed for its nitrogen, phosphorous, potassium, calcium, and magnesium concentration, as well as their respective electrical conductivity. Simultaneously, seeds germination percentage and seedling weight was also observed.

The results indicated that concentration of inorganic exudates and the EC of the soaking water had close and negative relationship with germination percentage and seedling weight along the storage periods examined. Based on this finding, the EC could be used as an alternative method for viability test of corn seeds.

Keywords : electrolite, inorganic exudate, electrical conductivity (EC), seed viability, corn.

[1] Alumni Fakultas Pertanian Universitas Gadjah Mada
[2] Staf pengajar Fakultas Pertanian Universitas Gadjah Mada

INTRODUCTION

Quality of seeds consists of genetical, physiological, and physical aspects. Those aspects are the key factors of seed germination and seedling growth. Seed viability measures the physiological aspect of seed quality, and manifests in ultimate metabolic processes, such as seed germination, vigor, and seedling growth (Sadjad, 1975).

Seed deterioration, as an indication of seed viability declination, is usually affected by unfavorable condition of storage room, length of storage, and internal condition of the seed itself. It was characterized by low germination capacity, vigor, and growth of seedling. The process is irreversible and starts soon after seeds reach physiological maturity (Abdul Baki and Anderson, 1972). Suseno (1975) mentioned that germination capacity and seedling vigor are widely used as measures of seed deterioration.

Bewley and Black (1978) stated that the degradation of cell membrane integrity in seed deterioration resulting in the control function loss towards membranes permeability. This condition affects the outflow of exudates from cells. The concentration of exudates (organic and inorganic) will be found in seeds soaking water, thus it relates with the degree of seed deterioration. The exudates mainly contain inorganic cations and organic compounds that have electrical conductivity (EC) (Copeland, 1976). If the amount of exudates has any relationship with the EC, we may measure the seed deterioration using this feature.

This experiment was conducted to obtain proofs on the relationship of electrical conductivity with the exudates as inorganic cations concentration, so that can be used as an indirect measurement of seed deterioration

MATERIALS AND METHODS

Newly harvested good quality corn seeds were obtained from Cereals Seed Production Station Soropadan, Central Java. Then the seeds were stored for one, two, three and four months under the condition of room temperature, placed in polyethylene bags. The moisture content of the seeds at the start of storage was 12.0 percent.

The design used in this experiment was Randomized Completely Design (CRD), single factor (periods of storage) three replications. Observations were done on the germination percentage, the electrical conductivity of the seeds soaking water, the concentration of inorganic exudates as Nitrogen, Phosphorous, Potassium, Calcium, and Magnesium in the seeds soaking water, and the weight of seedlings.

The data obtained were analysed statistically using varianc analysis of and the Duncan's New Multiple Range Test (Gomez and Gomez, 1976).

RESULTS AND DISCUSSION

The obtained data and the results of the analysis of variance on the germination percentage, fresh and dry weight of seedlings, electrical conductivity and the concentrations of Nitrogen,

Table 1. The Mean values of germination percentage (%), fresh weight of seedling (g), dry weight of seedlings (g), electrical conductivity (mmhos), concentration of inorganic exudates (Nitrogen, Phosphorus, Kalium, Calcium, and Magnesium (ppm)) in seeds soaking water, observer after storage.

Variable	Periods of Storage (Month)				
	0	1	2	3	4
Germination percentage	100 [a]	97 [a]	94 [a]	91 [bc]	87 [c]
Fresh weight	8.94 [a]	8.46 [a]	8.00 [ab]	6.79 [b]	6.25 [c]
Dry weight	4.47 [a]	4.37 [a]	3.97 [a]	2.66 [b]	2.38 [c]
Electrical conductivity	0.30 [a]	0.32 [b]	0.33 [bc]	0.35 [c]	0.64 [d]
Nitrogen	5.6 [a]	12.1 [b]	13.3 [b]	14.7 [b]	15.4 [b]
Phosphorous	1.64 [a]	1.92 [b]	3.33 [b]	4.08 [b]	7.18 [c]
Potassium	3.23 [a]	3.65 [b]	9.43 [b]	10.1 [c]	14.99 [d]
Calcium	0.06 [a]	0.07 [b]	0.13 [b]	0.31 [b]	1.05 [c]
Magnesium	0.18 [a]	0.20 [ab]	0.24 [b]	0.31 [b]	0.43 [c]

Notes: Mean values followed by the same letter in the same row are not significantly different (DMRT 5%).

Table 2. The correlations and regressions between the periods of storage (X) and the germination percentage, EC, fresh weight, dry weight of seedlings, concentration of Nitrogen, Phosphorus, Potassium, Calcium and Magnesium in seeds soaking water.

Dependent Variable	Correlation Coefficient	Regression Equation
Germination percentage	-0.999 *	Y = - 7.1 x + 100.0
Fresh weight	-0.985 *	Y = - 7.9 x + 9.19
Dry weight	-0.950 *	Y = - 0.58 x + 4.71
Electrical conductivity	-0.790 *	Y = - 0.071 x + 0.25
Concentration of Nitrogen	0.897 *	Y = 0.22 x + 7.78
Concentration of Phosphorus	0.945 *	Y = 1.32 x + 0.982
Concentration of Kalium	0.965 *	Y = 3.0 x + 2.29
Concentration of Calcium	0.840 *	Y = 9.22 x + - 0.12
Concentration of Magnesium	0.950 *	Y = 0.06 x + 0.02

Note : Significance at 5% level.

Table 3. The correlations and the regressions between the EC and the germination percentages, germination rate, and field emergences.

Variables	Correlation Coefficient	Regressions Equation
Germination percentages	- 0.674 *	Y = -0.023 x + 2.59
Germination rate	- 0.810 *	Y = -0.028 x + 1.139
Field emergences	- 0.795 *	Y = -0.029 x + 3.154

Note : Significance at 5% level.

Phosphorous, Potassium, Calcium, and Magnesium were presented in Table 1, and analysis correlation and regression results were presented in Table 2.

It was shown that the storage caused deterioration of seeds, denoted by increase of the concentration of the inorganic exudates in the seeds soaking water. The increment of these elements causing higher electrical conductivity, since the elements are electrolytes. The leakages were already significant starting from the second month of storage, and steadily increased up to the termination of the storage. The disintegration of the membranes were followed by the decrease of the viability of the seeds, manifested in seedling germination percentage, dry and fresh weight.

The results proved that germination percentage, fresh and dry weight of seedlings indicated significant positive correlations, while the other variables showed significant negative correlations.

Table 3 shows the correlation and regressions between the EC and the germination percentages, germination rate and the field emergences. It indicated that the EC of the seeds soaking water were significantly correlated to the lower germination and the field emergences of the corn seeds after storages.

Further analysis found that the correlations between EC and the concentration of inorganic exudates (Nitrogen, Phosphorus, Potassium, Calcium and Magnesium) were : r = 0.5719*; r = 0.9390*; r = 0.8259*; r = 0.9904*; and r = 0.9388* respectively. The elements, as electrolytes, gave the contributions to the EC of seeds soaking water of the aged corn seeds (Skoog and West, 1969).

CONCLUSION

The concentrations of the inorganic exudates increased with the longer the period of storages indicated the progress of the seed deterioration. The EC highly correlated with concentration of inorganic exudates, as germination percentages and the field emergences. The results also indi-

cated that the EC could be used as an alternative method for corn seeds viability tests.

LITERATURE CITED

Abdul Baki, A. A. and J. D. Anderson. 1972. Physiological and Biochemical Deterioration of Seeds. In: T. T. Kozlowski. (ed.). *Seed Biology II*. New York: Academic Press. pp 283 – 309.

Bewley, J. D. and M. Black. 1978. *Physiology and Biochemistry of Seeds I*. Springer–Verlag, Berlin – Heidelberg. New York.

Copeland, L. O. 1976. *Principles of Seed Science and Technology*. Burgess Publishing. Minneapolis.

Gomez, K. A. and A. A. Gomez. 1976. *Statistical Procedures for Agricultural Research*. Los Banos.

Sadjad, S. 1975. Teknologi Benih dan Masalah-Masalahnya. In Sadjad (ed.). *Dasar-Dasar Teknologi Benih*. IPB Bogor. pp: 1–11.

Skoog, D. A. and D. M. West. 1969. *Fundamental of Analytical Chemistry*. Holt Rinehart and Winston Inc. New York.

Suseno, H. 1975. Fisiologi dan Biokimia Kemunduran Benih. In: S.Sadjad (ed.) *Dasar-Dasar Teknologi Benih*. IPB Bogor. pp : 98 – 126.

Ilmu Pertanian, Vol. 8 No. 2, 2001: 66 - 75

KAJIAN FISIOLOGIS DAN BIOKIMIAWI BENIH RAMBUTAN (*Nephelium lappaceum* L.) SELAMA PENYIMPANAN DENGAN PERLAKUAN ABA DAN GA_3

A STUDY ON PHYSIOLOGICAL AND BIOCHEMICAL PROPERTIES OF RAMBUTAN SEEDS TREATED WITH ABA AND GA_3 IN STORAGE

Okti Purwaningsih[1]

ABSTRACT

*A study of the effect of plant growth regulators on rambutan (*Nephelium lappaceum L.*) seed viability after storage was conducted for 5 months. The purpose of this experiment was to study the effect of abscisic acid, gibberellic acid, and length of storage on rambutan seed germination and seedling growth, and to observe the biochemical and physiological changes during storage.*

The experiment used 3 x 4 x 6 factorial design with four replications and arranged in a Completely Randomized Design. The first factor consisted of three levels of abscisic acid concentrations, i.e. 0, 50, and 100 ppm. The second factor was levels of gibberellic acid, i.e. 0, 100, 200, and 300 ppm. The third factor was storage duration with six levels, i.e.: 1, 2, 3, 4, 5, and 6 weeks. Observation was done weekly throughout 6 weeks of storage.

The results showed that moisture content of the seeds were still high at the end of the storage, but the amount of infected seeds due to fungal attack and seed germination at storage were high too. It was showed that abscisic acid of 50 ppm inhibited seed germination during storage and the viability of rambutan seeds were still high up to three weeks of storage. Concentration of gibberellic acid of 300 ppm increased rambutan seedling significantly growth .

Keywords: abscisic acid, gibberellic acid, storage duration, rambutan.

INTISARI

Kajian mengenai zat pengatur tumbuh dilakukan untuk mengetahui pengaruhnya terhadap viabilitas biji rambutan (*Nephelium lappaceum* L.) setelah disimpan selama 5 bulan. Penelitian ini bertujuan untuk mengetahui pengaruh asam absisat, asam giberelat, dan lama penyimpanan benih terhadap perkecambahan biji dan pertumbuhan bibit rambutan, sekaligus mengetahui perubahan biokimiawi dan fisiologis selama disimpan.

Percobaan menggunakan rancangan faktorial 3 × 4 × 6 dengan empat ulangan yang disusun dalam Rancangan Acak Lengkap. Faktor perlakuan pertama adalah kadar asam absisat yang terdiri 3 aras, yaitu 0, 50, dan 100 ppm. Faktor perlakuan kedua adalah kadar asam giberelat yang terdiri 4 aras, yaitu 0, 100, 200, dan 300 ppm. Faktor ketiga adalah lama penyimpanan yang terdiri 6 aras, yaitu 1, 2, 3, 4, 5, dan 6 minggu. Pengamatan dilakukan setiap minggu selama 6 minggu penyimpanan.

Hasil penelitian menunjukkan bahwa kadar air biji rambutan tetap tinggi sampai akhir penyimpanan, akan tetapi jumlah biji yang terinfeksi jamur maupun biji yang berkecambah selama disimpan juga tetap tinggi. Kadar asam absisat 50 ppm ternyata menghambat perkecambahan biji rambutan selama disimpan, dan viabilitas biji rambutan masih tinggi sampai 3 minggu penyimpanan. Kadar asam giberelat 300 ppm meningkatkan secara nyata pertumbuhan bibit rambutan.

Kata kunci: asam absisat, asam giberelat, lama penyimpanan, rambutan

[1] Staf Pengajar Fakultas Pertanian Universitas PGRI Yogyakarta