Scientific Electronic Archives
Issue ID: Sci. Elec. Arch. 9:3 (2016)
July 2016
Article link:
http://www.seasinop.com.br/revista/index.php?journal=SEA&page=article&op=view&path%5B%5D=351&path%5B%5D=pdf
Included in DOAJ, AGRIS, Latindex, Journal TOCs, CORE, Discoursio Open Science, Science Gate, GFAR, CIARDRING, Academic Journals Database and NTHRYS Technologies, Portal de Periódicos CAPES.

ISSN 2316-9281

M. Sorace[2]*, C. A. Cossa[1], M. A. F. Sorace[1], E. A. F. Osipi[1], R. Marchi[1], R. Osipe[1]

[1]Universidade Estadual do Norte do Paraná, Campus Luiz Meneghel
[2]Universidade Estadual de Maringá, Campus Umuarama

***Author for correspondence:** mauren_band@hotmail.com

Abstract. *Selenicereus megalanthus (K. Schumer Vaupel) Moran* is known as yellow Pitaya because of yellow peel color.Originated from Colombia, Peru, Ecuador and Bolivia, it belongs to the family Cactaceae and has climbing habit, besides being edible and currently grown. In Brazil the production of yellow pitaya is incipient. Pitaya propagates through cuttings, seed or grafting. Its seeds have sarcotesta mucilaginous, which may be a deterrent factor or decrease germination.This study aimed to study biometric aspects and germination of seeds with and without mucilage removal. The removal of mucilage was made by immersion in 25% sucrose solution and were evaluated biometric aspects of fruit and seed quality through tests of germination and tetrazolium, rate of germination speed and imbibition curve. Through biometrics establishes the relationship between the size of the fruit and seed number, where the number of seeds per unit mass is greater in smaller fruits. The continuous production of mucilage prevented the establishment of imbibition curve. The result obtained in the tetrazolium test was not consistent with the germination. Seeds with mucilage removal by pretreatment with sucrose solution showed better germination and IVG, producing stronger plants.
Keywords: yellow pitaya, force, tetrazolium, imbibition curve

Introduction

Selenicereus megalanthus (K. Schum ex Vaupel) Moran, known as yellow Pitaya, is one of the Cactaceae family species most cultivated currently, family with great economic importance due to the ornamental value, being grown, collected and marketed by various parts of the world (ROCHA; AGRA, 2002).

In Brazil, the production of Pitaya is incipient, and most important production of Hylocereusundatus species. Typically, *Selenicereus megalanthus*is imported from Colombia and sold in Brazil (JUNQUEIRA et al., 2002).

The Pitaya fruit have exotic-looking, pleasant taste and varied size, having aroused the interest of producers for its high value (JUNQUEIRA et al., 2002; SOUZA, 2010).

Mizrahiet al.(1997 reported that Yellow Pitaya is the species with the best flavor, with the best prices in the market. It has better quality when maturation is complete, ie when all the fruit is yellow (NERD e MIZHARI, 1999).

Pitaya can propagate vegetatively by cuttings, seed or grafting; and propagation by cuttings more usual by ease and speed with which the plant reaches the production stage (JUNQUEIRA et al., 2002).

For propagation by seed, the presence of mucilaginous sarcotesta can be a deterrent factor or decrease in germination and subsequent production of normal seedlings. In the Rules for Seed Analysis (RSA) there are no references to the genera of pitaya, and were not found in other official technical productions.This study aimed to study biometric and physiological aspects of seed germination of *Selenicereus megalanthus* with and without mucilage removal.

Methods

In the trial conducted in Applied Botany Laboratory were used ripe fruit of *Selenicereus megalanthus* (Photo1).

Photo 1 -Fruits of *S.megalanthus*. Source: Personal Archive

The variables analyzed were the biometric characteristics of the fruit: length and diameter with the use of digital caliper; Fresh weights of peel and pulp with digital scale and number of seeds per fruit.The extraction of the seeds was done in colander under running water. For the removal of mucilage, half the seeds have been subjected to pre-treatment in 25% sucrose solution for five days and dried on filter paper for 24 hours, methodology for the elimination of sarcotesta seed jaracatiá (COSSA et al., 2009).

The evaluations were carried out by the tetrazolium test, germination test, the germination speed index (GSI) and the imbibition curve seeds with and without sarcotesta.

The germination test was carried out in plastic boxes with seeds on moistened filter paper with distilled water. The design was completely randomized with two treatments and four replications of 25 seeds. Means were compared by 5% Tukey test.

The first evaluation of germination was on the 5th day after sowing (d.a.s.) and the other at 13° and 21° d.a.s., being considered germinated seeds with radicle protrusion.

The calculation of germination speed index was performed using the formula proposed by Maguire (1962):

$$\mathrm{IVG} = \frac{\mathrm{G1}}{\mathrm{N1}} + \frac{\mathrm{G2}}{\mathrm{N2}} + \cdots \frac{\mathrm{Gx}}{\mathrm{Nx}}$$

Where: G1, G2 ... Gx refer to the number of germinated seeds in the 1st, 2nd ... N° ratings; N1, N2 ... Nx refers to the number of days from the 1st count.

For imbibition curve used six replicates 3g seeds, placed in Petri dishes with distilled water at room temperature. The seeds were removed from the plates, dried on absorbent paper and weighed on a precision scale at intervals of one, eight and twelve hours due to weight stabilization.

For the tetrazolium assay were used five replications of 10 seeds subjected to imbibition for two hours. Subsequently they were sectioned longitudinally with a scalpel, placed on Petri dishes with 1% tetrazolium solution and evaluated after 12 hours.

The data analyzed by ANOVA and the means compared by Tukey test at 5% significance level for statistical analysis software MSSA-Agri®(CANTERI et al., 2001).

Results and discussion

The number of seeds per fruit varies depending on the size. The number of seeds per unit mass and total pulp mass was higher in smaller fruits and lower in larger fruits (Figure 1).

The size of the fruit of *S. megalanthus* can set a parameter to estimate the number of seeds, despite the wide variation between the number of seeds in cactus species (ROJAS-ARÉCHIGA et al., 2000; GODÍNEZ-ALVAREZ et al., 2003) and within the same species. These differences may be due to age, the size of the plant and also the number of flowers per plant (ROJAS-ARÉCHIGA et al., 2000).The results suggest that smaller fruits have higher number of seeds per mass, and therefore more interesting when the goal is the propagation of the species.According to Weiss et al. (1995), there is a positive correlation between fruit weight and number of viable seeds.

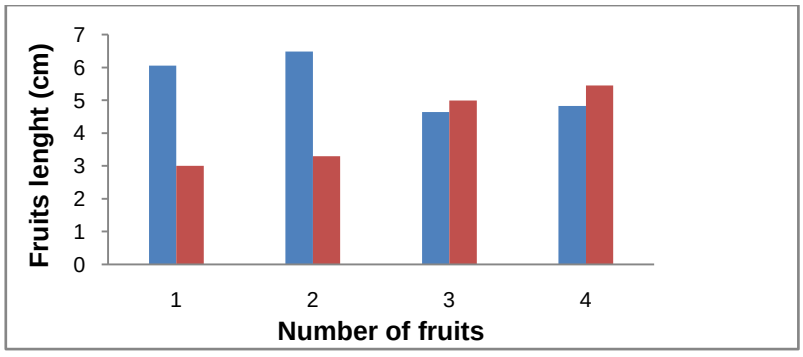

Figure 1. Relationship between number of seeds per gram pulp (blue bar) and size of the fruit of *S. megalanthus* (red bar).

The fresh weight of fruit weight has shown that the peel represented 38% of the fruit, pulp was 34% and the seed was 28% (Figure 2).In working with red pitaya fruit (*Hylocereus undatus*), Souza et al. (2006) reported that the mass of the pulp was higher than of the shell. During the maturation period there is an increase in the mass of pulp and decrease in mass of the shell (ORTIZ, 2013).In the first count was no difference between the treatments, however varied in the intermediate and final scores (Table 1) which resulted in greater IVG in the treatment with sucrose.

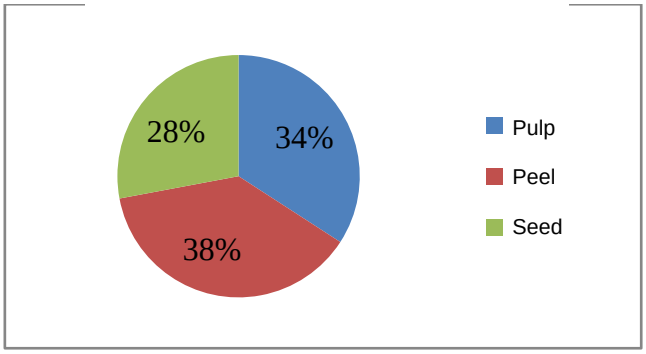

Figure 2. Distribution of fresh mass of peel, pulp and seeds of fruits of *S. megalanthus*.

Table 1. Average and germination percentages of seed of *S. megalanthus* at 5º, 13º and 21º days after sowing (D.A.S.) and IVG.

D.A.S.	5		13		21		IVG
Treatments	Average	%	Average	%	Average	%	
T1- with sucrose	0,25 b	1,05	13,50 a	57,22	16,75 a	71	1,36 a
T2- no sucrose	5,50 a	22	16,25 a	65	19,75 a	79	2,10 b
C.V. (%)	44,34		15,46		12,95		

Means followed by the same letter on the line do not differ by Tukey test at 5% significance.

The seeds subjected to treatment with 25% sucrose solution produced more vigorous seedlings that the seeds that remained with the mucilage (Photo2).

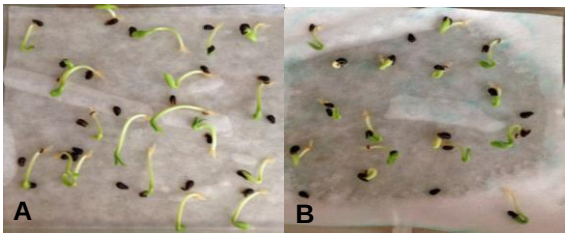

Photo 2 - Seedlings *S. megalanthus* from pre- seed treated with sucrose (A) and without sucrose (B). Source : Personal Archive.

The IVG pretreated with seed sucrose solution was 2.10, while for the IVG of untreated seed was 1.36; indicating that the seeds treated with sucrose solution showed a higher rate of germination compared to untreated seeds (Figure 3) and high mucilage regeneration potential when hydrated.Similar results were obtained with *H. undatus*, where the removal of mucilage influenced germination and seed vigor (Alves et al., 2012).

To *S. megalanthus* removing seed mucilage was favorable for germination, corroborating Carmona et al. (1994),that reported that the presence of the seed mucilage is a limiting factor for germination, to contain inhibitory substances metabolism and this may be detrimental to the developing seedling.

The embodiment of the imbibition curve was frustrated by the presence of mucilage (Photo 3), as well as seed *Jacaratia spinosa* (Aubl.), in which it was cannot be evaluated the seed water inlet for the construction of imbibition curve due to formation of mucilage (Mombach, 2010).

Photo 3 - *S. megalanthus* seeds with mucilage. Source: Personal Archive.

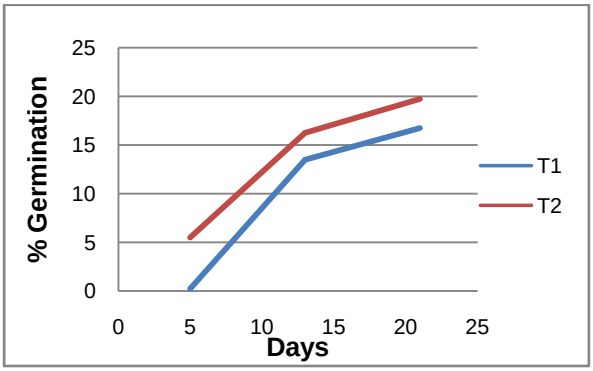

Figure 3. Average and seed germination percentages of *S. megalanthus*without pretreatment of sucrose and sucrose pretreatment(T1 = no sucrose; T2 = with sucrose)to 5 ° , 13 ° , 21° days after sowing (DAS) and IVG.

The result of the tetrazolium test (Table 2) was not consistent with the results of germination tests on seeds, which may have been caused by faults in the conduction arising from the absence of specific methodology for *S. megalanthus* species.

Table 2. Tetrazolium test of *S. megalanthus* of seed without pretreatment with sucrose solution.

Color pattern	Number of seeds	% ofseeds
Inactive	17	34
Viable	11	22
High coloration	22	44

Following the same pattern in other species in RSA, there is the possibility of seed color are considered high physiologically able to germinate, but at a more advanced stage of metabolic activity of than viable seeds.Among the seeds considered inactive, there are those that could be starting the process of germination, because some of his embryonic structures have reacted to the tetrazolium salt (Photo 4), indicating the presence of oxygen. Therefore, the presence of active metabolism implies specific methods for evaluation of seed vigor of *S. megalanthus*by the tetrazolium test.

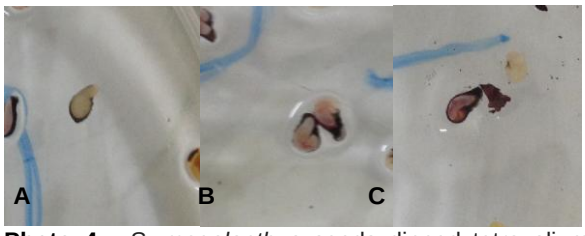

Photo 4 - *S. megalanthus* seeds dipped tetrazolium solution at 1 % deemed inactive (A) , viable (B) and very stained (C). Source: Personal Archive .

Conclusion

Biometrics demonstrated that the smallest fruits showed greater number of seeds, besides the weight of the fresh weight of the shell is greater than that of the pulp and seed.

The pretreatment of the seeds with 25% sucrose solution favored removal of the mucilage and the speed of germination, producing stronger plants.

The imbibition curve of the seeds was unfeasible due to continuous production of mucilage.

The tetrazolium test was not conducive to germination, having need to set protocol.

References

ALVES, C. Z., GODOY, A. R., OLIVEIRA, N. C. Efeito da remoção da mucilagem na germinação e vigor de sementes de *Hylocereusundatus* Haw. Revista Brasileira de Ciências Agrárias (Agrária).**Brazilian Journal of Agricultural Sciences**, *7*(4), 586-589, 2012. DOI: 10.5039/agraria.

CANTERI, M. G., ALTHAUS, R. A., VIRGENS FILHO, J. S., GIGLIOTI, E. A., GODOY, C. V. SASM – Agri: Sistema para análise e separação de médias em experimentos agrícolas pelos métodos Scoft – Knott, Tukey e Duncan. **Revista Brasileira de Agrocomputação**, v.1, n.2, p.18-24. 2001.http://www.agrocomputacao.deinfo.uepg.br/dezembro_2001/Arquivos/RBAC_Artigo_03.pdf

CARMONA, R.; REZENDE, L.P.; PARENTE, T.V. Extração química de sementes de gabiroba (*Campomanesia adamantium* Camb.). **Revista Brasileira de Sementes**, Brasília, v.16, n.1, p.31-33, 1994.

COSSA, C. A., LIMA, C. B., OSIPI, E. A. F., SORACE, M. A. F., ALMEIDA, B. N., LORENÇO, C. C., POLONIO, V. D. Remoção da mucilagem e análise da viabilidade de sementes de Jacaratia spinosa (Aubl.) A. DC. **Cadernos de Agroecologia**, 4(1), 2009.

GODÍNEZ-ÁLVAREZ, H.; VALVERDE T.; ORTEGA-BAES, P. Demographic trends in the Cactaceae. **The Botanical Review,** 69(2): 173-203, 2003.

JUNQUEIRA, K.P.; JUNQUEIRA, N.T.V.; RAMOS, J.D.; PEREIRA, A.V. Informações preliminares sobre uma espécie de pitaya do Cerrado. **Embrapa Cerrados:**Planaltina-DF, 2002. 18p. (Documentos, 62).

MAGUIRE, J. D. Speed of germination: aid in selection and evaluation for seedling emergence and vigour. **Crop Science**, v. 2, n. 2, p. 176, 1962.

MOMBACH,T.C.; **Germinação de sementes de Jaracatiá. Pontifícia Universidade Católica do Paraná**. Curitiba, p. 1-17, 2010.

MIZRAHI, Y., A. NERD, P.S. NOBEL. Cacts as Crops.**Horticultural Review**.New York, v.18, n.1, p.291-320,
1997.DOI: 10.1002/9780470650608.ch6

NERD A., MIZRAHI Y. The effect of ripening stage on fruit quality after storage of yellow pitaia. **Postharvest Biology and Technology**, 15(2): 99-105, 1999.DOI: 10.1016/S0925-5214(98)00080-5

ORTIZ, T.A. **Maturidade fisiológica de frutos e sementes de pitaya [*Hylocereus undatus* (Haworth) Britton & Rose].** Universidade Estadual de Londrina. Centro de Ciências Agrárias. Programa de Pós- Graduação em Agronomia. p. 12-79, 2013.

ROCHA, E. A. & AGRA, M. F. Flora do Pico do Jabre, Paraíba, Brasil: Cactacea e Juss. Acta Botânica Brasílica.**16 (1), São Paulo. 2002.**http://dx.doi.org/10.1590/S0102-33062002000100004

ROJAS-ARÉCHIGA, M.; VÁZQUEZ-YANES, C. Cactusseedgermination: a review. **Journal of Arid Environments**, 44: 85-104, 2000.http://dx.doi.org/10.1590/S2317-15372013000300006

SOUZA, L. S.; JUNQUEIRA, K. P.; NASCIMENTO, A. H. C.; GERMENDORFF, A. L.; JUNQUEIRA, N. T. V.; FALEIRO, F. G.; SANTOS, E. C.; BELLON, G.; JUNQUEIRA, L. P. Características físico-químicas de frutos de pitaya CPAC-PY-01 cultivada no cerrado. Planaltina, DF: Embrapa Cerrados, 2006. Disponível em:http://bbeletronica.cpac.embrapa.br/versaomodelo/html/2006/posteres/p2006_45.shtml. Acesso: 25 de out de 2014.

WEISS, J.; SCHEINVAR, L.; MIZRAHI, Y. *Selenicereus megalanthus*(the yellow pitaya), a climbing cactus from Colombia and Peru.**Cactus and Succulent Journal (US)**, v.67, n.1, p.280–283, 1995. http://www.bioone.org/loi/casu