The Bioscan 11(3): 1419-1423, 2016
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.com

STORAGE POTENTIAL OF *BT* AND NON-*BT* COTTON VARIETIES AS INFLUENCED BY SEED TREATMENTS AND CONTAINERS

K. H. HEMASHREE*, M. R. ESHANNA AND M. B. KURDIKERI
Department of Seed Science and Technology, UAS, Dharwad - 580 005, Karnataka, INDIA
e-mail: hemagrb@gmail.com

KEYWORDS
Calcium Oxychloride ($CaOCl_2$)
Germination
Seed treatment
Storage

Received on :
26.03.2016

Accepted on :
11.07.2016

***Corresponding author**

ABSTRACT
An laboratory experiment was conducted to know the storage potential of *Bt* cotton cv. Bikaneri Nerma and non *Bt* cotton cv. Sahana with four seed treatments *viz*. thiram 75 per cent WDP @ 2g per kg seeds, imidachloprid @ 3 g per kg seeds, $CaOCl_2$ @ 3 g per kg seeds, sweet flag rhizome @ 10 g per kg seeds and were packed in cloth bag, polythene bag (700 gauge), aluminum pouches and stored under ambient conditions. Results revealed that after nine months of storage the *Bt* cotton variety recorded higher germination (63.81 %), field emergence (59.81 %) and other seed quality parameters were higher compared to non *Bt* cotton. Among the seed treatments, seed treated with $CaOCl_2$ recorded higher germination (66.95%), field emergence (62.95%) and other seed quality parameters after nine months of storage. Seeds packed in aluminum foil pouches recorded higher germination (68.03%), field emergence (64.03 %) and other seed quality parameters compared to seeds stored in other containers. Conclusively the *Bt* cotton seeds treated with $CaOCl_2$ @ 3 g kg^{-1}seedsandstored in aluminum pouches are better to maintain higher seed quality parameters up to nine months of storage.

INTRODUCTION

Cotton (*Gossypiumhirsutum*L.) is one of the principal commercial crop playing a key role in the economic, social and political affairs of the country. It is one of the most important natural fibre and called as the "King of fibres" and also called as the ''White gold'' because of its white shiny lint, which enjoys premier position amongst all the commercial crops in India. It is an important raw material, supplying about 65 per cent requirement of the Indian textile industry and providing employment directly or indirectly to about 35 million people. In recent years, tremendous growth in Indian agriculture productivity has been witnessed on account of novel applied bio-technological research especially in developing *Bt* cotton varieties to combat pest and diseases menace.Seeds of *Bt*. cotton varieties are produced and supplied to farmers for commercial cultivation by both public and private seed producers. In the chain of seed production, storage of seeds assumes a greater importance as the "Seed saved is seed produced" an old adage holds well even today. The timely production and supply of good quality seed is one of the important factor responsible for increased productivity as the quality seed is one of the basic agricultural input for obtaining higher yield. The seed yield and quality are greatly influenced by several factors, among which the quality seeds assume greater significance.

Seed being a biological or living entity, deterioration in its quality is inevitable, irreversible and inexorable. It occurs with advance in ageing, which is common for all the living organisms. In storage, number of biotic and abiotic factors influence storage potential of seeds and results in gradual seed deterioration and ultimately death of the seeds.Maintenance of seed with high quality until it is needed for next sowing is a paramount task of any seed production programme. Diverse biological processes occur in the seed during storage results in seed deterioration that leads to reduction in vigour and viability of the seeds (Roberts, 1972 and Abdul-Baki and Anderson, 1973). However, the rate of seed deterioration could be slowed down by certain seed treatments with fungicides, insecticides and storing them in suitable moisture impervious containers (Doijode, 1988).

In view of the previous work done by different authors like (Pham and Ramegowda, 2007) in paddy and (Hareeshet *al*. 2014) in pigeon pea and Amrutha *et al*. (2015) in black gram it can be assumed that seed treatment with chemicals and stored in moisture proof containers is proved to maintain higher seed quality during storage.However, the information on storage potential of *Bt*- cotton varieties pertaining to influence of seed treatments and containers are very scanty. Hence, present study was planned to know the storage potential of *Bt* and non - *Bt* cotton varieties as influenced by seed treatments and containers.

MATERIALS AND METHODS

The storage experiment was conducted for a period of nine months under ambient condition in the department of Seed Science and Technology, College of Agriculture, UAS, Dharwad. Freshly harvested, delinted seeds of *Bt*. Cotton cv. Bikaneri Nerma andnon *Bt*. Cotton seeds cv. Sahana were obtained from the Agricultural Research Station, Hebballi Farm, Dharwad. Experiment was laid out in complete randomized

design with factorial concept in four replications. First factor varieties *viz*., Bt. Cotton cv. BikaneriNerma (V_1) and non *Bt*. Cotton cv. Sahana (V_2), second factor seed treatment with chemicals *viz*., control (T_0), Thiram 75 % WDP @ 2 g kg^{-1} seeds (T_1), Imidachloprid @ 3 g kg^{-1} seeds (T_2), : Calcium oxy chloride @ 3 g kg^{-1} seeds (T_3) and Sweet flag rhizome powder @ 10 g kg^{-1} seeds (T_4) andthird factor containers *viz*., Cloth bag (C_1), Polythene bag(700 gauge) (C_2) and Aluminum foil pouches (C_3).

The required quantity of seeds were first smeared with 10 per cent adhesive gum solution and then mixed with the required quantity of thiram (2 g/kg seeds), Imidachloprid (3 g/kg seeds) and sweet flag powder (10 g/kg seeds) as a dry seed treatment(Sandya Rani, 2002). Similarly in case of vapour treatment the seeds were halogenated with vapours of calcium oxychloride (3 g/kg seeds) by keeping seeds over CaOCl2 on wire mesh for 72 hours in air tight desiccators followed by dry dressing with the same chemical used for vapour treatments. After treating the seeds 250 g of seeds were packed in cloth bag, aluminum foil pouches, polythene bag (700 gauges) and immediately heat sealed (Tejashwini*et al,* 2014). Observation on various seed quality parameters were recorded after nine months of storage. The seed moisture content was estimated on dry weight basis as per the standard procedure (ISTA, 2006) and expressed in per cent.Germination per cent was determined as per ISTA rules for seed testing. The seeds were placed in rolled paper towels. Hundred seeds of four replications were tested at a constant temperature of 25°C. The number of normal seedlings were evaluated on 14th day and per cent germination was expressed on normal seedling basis (ISTA, 2006).Field emergence was calculated by sowing one hundred seeds from each treatment in four replications in the field. The emergence counts were made on 14th day after sowing and expressed in per cent (ISTA, 2006). The shoot length was measured from collar region to the point of attachment of cotyledons and root length from the collar region to the tip of the primary root. After measuring the root and shoot length the seedlings kept in the hot air oven at 85 ± 1°C for 24 hours. The dry weight (mg) was measured and expressed as mean dry weight (mg/seedling).The speed of germination was calculated by using formula suggested by (Maguire, 1962).The mean data of the experiment were statistically analyzed by using appropriate statistical methods as outlined by (Panse and Sukhatme, 1978). The critical differences were calculated at one per cent level of probability wherever 'F' test was found significant.

RESULTS AND DISCUSSION

Effect of varieties on seed quality during storage

In storage quality of seeds varies from genera to genera, species to species, variety to variety, as the viability and vigour of seeds are influenced by genetic makeup of the varieties involved (Agrawal, 1974). Apart from genetic factors, the storability of different varieties is also regulated by initial seed quality, pre and post-harvest factors, physical and chemical composition of seed (Doijoide, 1988) which determine the longevity of seed in storage. Loss of germination is the last physiological manifestation of decline in quality of seed during storage. The results revealed that, the *Bt* cotton cv. Bikaneri Nerma recorded significantly higher germination(63.81 %), field emergence (59.81 %), speed of germination (42.38), shoot length (11.42 cm), root length (15.75 cm) and seedling dry weight (64.2 mg) with lowest moisture content (8.29 %) compared to non *Bt* cotton cv. Sahana (62.62 %, 58.62%, 41.61, 10.01 cm, 14.50 cm and 62.2 mg, with highest moisture content 8.31 %)after nine month of storage (Table 1, 2, 3 and 4). Such difference in storage potential between varieties may be attributed mainly to difference in their genetic makeup and environmental influence(Divya Shree, 2006). The difference in seedling length and gradual decrease noticed may be attributed to inherent genotypic differences and the amount of food reserves mobilized which ultimately contributed for longer seedling length(Sandya Rani. 2002) and

Table 1: Effect of varieties, treatments and containers on moisture content (%) and germination (%) during storage

Treatments	Storage period							
	Moisture content (%)				Germination (%)			
	0	3	6	9	0	3	6	9
Varieties								
V_1 : *Bt*. Cotton cv. Bikaneri Nerma	7.39	10.12	8.42	8.29	95.14	81.45	72.33	63.81
V_2 : Non *Bt*. Cotton cv. Sahana	7.41	10.15	8.37	8.31	95.06	80.81	71.08	62.62
S.Em ±	0.01	0.02	0.04	0.02	0.18	0.10	0.08	0.08
CD (1 %)	0.48	0.26	0.16	0.61	0.86	0.62	0.55	0.57
Treatments								
T_0 : Thiram 75 % WDP @ 2 g kg^{-1} seeds	7.35	10.42	8.24	8.06	95.45	82.650	72.66	64.16
T_1 : Imidachloprid @ 3 g kg^{-1} seeds	7.47	10.51	8.44	8.21	93.87	77.79	67.83	60.45
T_2 : Calcium oxy chloride @ 3 g kg^{-1}seeds	7.32	10.17	8.13	8.03	96.33	84.16	75.83	66.95
T_3 : Sweet flag rhizome powder @ 10 g kg^{-1} seeds	7.47	10.48	8.41	8.18	94.75	80.08	70.56	61.29
S.Em ±	0.01	0.05	0.03	0.02	0.26	0.14	0.11	0.11
CD (1%)	NS	0.45	0.09	0.07	1.025	0.73	0.65	0.67
Containers								
C_1 : Cloth bag	7.54	11.73	9.55	9.23	93.43	77.37	67.50	54.93
C_2 : Polythene bag	7.36	9.85	7.73	7.67	94.96	81.46	72.62	66.68
C_3 : Aluminum pouch	7.30	9.61	7.45	7.48	96.90	84.56	75.00	68.03
S.Em ±	7.40	10.40	8.3	8.12	0.23	0.12	0.09	0.10
CD (1%)	0.01	0.04	0.25	0.02	0.95	0.68	0.61	0.63

Table 2: Effect of varieties, treatments and containers on field emergence (%) and speed of germination during storage

Treatments	Storage period							
	Field emergence (%)				Speed of germination			
	0	3	6	9	0	3	6	9
Varieties								
V_1 : Bt. Cotton cv. Bikaneri Nerma	93.14	78.45	69.33	59.81	44.81	43.91	43.37	42.38
V_2 : Non Bt. Cotton cv. Sahana	93.06	77.81	68.08	58.62	44.77	43.70	42.43	41.61
S.Em±	0.15	0.09	0.07	0.08	0.05	0.04	0.10	0.72
CD (1 %)	0.45	0.27	0.22	0.24	0.15	0.12	0.31	NS
Treatments								
T_0 : Thiram 75 % WDP @ 2 g kg^{-1} seeds	93.45	79.50	69.66	60.16	44.70	44.00	43.16	40.65
T_1 : Imidachloprid @ 3 g kg^{-1} seeds)	91.87	74.79	64.83	56.45	44.01	43.79	41.98	40.18
T_2 : Calcium oxy chloride @ 3 g kg^{-1}seeds	94.33	81.16	72.83	62.95	44.80	44.00	43.56	41.14
T_3 : Sweet flag rhizome powder @ 10 g kg^{-1} seeds	92.75	77.08	67.50	57.29	44.60	43.80	42.91	40.25
S.Em±	0.21	0.13	0.10	0.11	0.06	0.06	0.15	1.02
CD (1%)	0.63	0.38	0.31	0.33	0.19	0.18	0.45	NS
Containers								
C_1 : Cloth bag	91.43	74.37	64.50	50.93	43.66	42.80	40.75	39.56
C_2 : Polythene bag	92.96	78.46	69.62	62.68	44.78	44.08	42.23	40.75
C_3 : Aluminium pouch	94.90	81.56	72.00	64.03	45.77	44.58	43.65	41.00
S.Em±	0.18	0.11	0.09	0.10	44.79	43.81	42.90	42.00
CD (1%)	0.55	0.33	0.27	0.29	0.06	0.05	0.13	0.89

Table 3: Effect of varieties, treatments and containers on shoot length (cm) and root length (cm) during storage

Treatments	Storage period							
	Shoot length (cm)				Root length (cm)			
	0	3	6	9	0	3	6	9
Varieties								
V_1 : *Bt*. Cotton cv. Bikaneri Nerma	19.80	16.28	14.29	11.42	19.72	18.42	17.49	15.75
V_2 : Non *Bt*. Cotton cv. Sahana	18.45	14.52	11.74	10.01	19.60	18.27	17.12	14.50
S.Em±	1.51	0.22	0.01	0.14	0.19	0.06	0.06	0.15
CD (1 %)	NS	NS	0.22	0.22	NS	NS	0.14	0.33
Treatments	19.80	16.28	14.29	11.42	19.72	18.42	17.49	15.75
T_0 : Thiram 75 % WDP @ 2 g kg^{-1} seeds	18.13	15.96	13.34	10.82	19.39	18.94	17.61	16.46
T_1 : Imidachloprid @ 3 g kg^{-1} seeds)	17.97	14.20	12.04	9.90	19.37	18.59	17.53	15.96
T_2 : Calcium oxy chloride @ 3 g kg^{-1}seeds	22.35	16.17	13.56	11.84	20.68	18.94	17.86	16.47
T_3 : Sweet flag rhizome powder @ 10 g kg^{-1} seeds	18.04	15.27	13.12	10.30	19.38	18.78	17.53	16.19
S.Em±	2.14	0.31	0.21	0.20	0.27	0.09	0.09	0.21
CD (1%)	NS	0.52	0.31	0.32	1.04	0.28	NS	0.47
Containers								
C_1 : Cloth bag	17.71	14.75	12.50	9.75	19.30	18.84	17.48	15.00
C_2 : Polythene bag	18.31	15.42	13.04	10.76	19.44	18.57	17.69	16.07
C_3 : Aluminum pouch	21.34	16.04	13.50	10.87	20.38	19.03	17.73	16.71
S.Em±	1.85	0.27	0.18	0.17	19.66	18.30	17.53	16.19
CD (1%)	NS	NS	NS	0.42	0.24	0.08	0.08	0.19

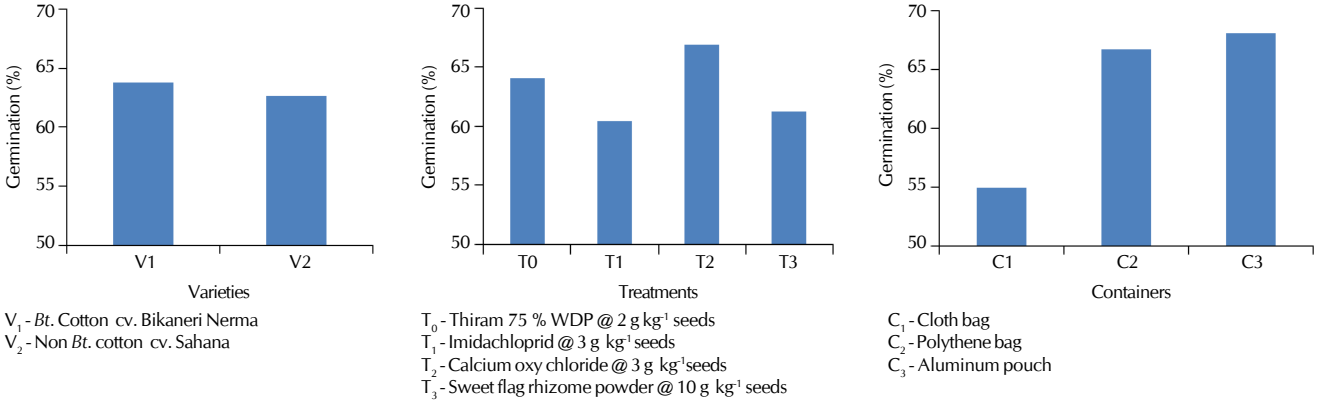
(Shivayogi, 2003) in cotton and (Vasudevan *et al*., 2015) in chickpea.

Effect of seed treatment on seed quality during storage

Seed quality parameters *viz*., physiological and biochemical changes leading to seed deterioration have been related to increased activity of enzymes *viz*., catalase and peroxidase (Shakuntala *et al*., 2012), lipid auto oxidation (Basu and Rudrapal, 1980) and accumulation of toxic metabolites, free radical damage, decreased protein synthesis breakdown in mechanism of triggering germination. During storage, viability and vigour are least due to many biotic factors like storage pests and other micro flora. The insect and fungi cause considerable damage and will be responsible for deterioration and reduction in storage potential of seed. So seed treatment with chemicals will reduce the qualitative and quantitative losses besides maintaining the quality of seed for longer period. Among the different treatments seeds treated with Calcium oxy chloride @ 3 g kg^{-1}seeds registered significantly higher germination (66.95 %), field emergence (62.95 %), speed of germination (41.14), shoot length (11.84 cm), root length (16.47 cm) and seedling dry weight (65.3 mg) with lowest moisture content (8.03 %) followed by seeds treated with thiram. Whereas, lowest values (60.45 %, 56.45%, 40.18, 9.90 cm, 15.96 cm and 62.7 mg, respectively with highest moisture content (8.21 %) were observed in seeds treated with Imidachloprid @ 3 g kg^{-1} seeds (Table 1, 2, 3 and 4). The beneficial influence of calcium oxhychloride observed throughout the storage period may be related to its antioxidant property resulting in decreased lipids auto oxidation and prevention of production of secondary cytotoxic aldehydes

Table 4: Effect of varieties, treatments and containers on seedling dry weight (mg) during storage

Treatments	Storage period Seedling dry weight (mg) 0	3	6	9
Varieties				
V_1 : *Bt*. Cotton cv. Bikaneri Nerma	85.9	79.0	71.2	64.2
V_2 : Non *Bt*. Cotton cv. Sahana	83.8	76.8	68.9	62.2
S.Em ±	0.3	0.1	0.1	0.2
CD (1 %)	0.9	0.4	0.4	0.5
Treatments	85.9	79.0	71.2	64.2
T_0 : Thiram 75 % WDP @ 2 g kg^{-1} seeds	84.7	77.4	70.5	62.5
T_1 : Imidachloprid @ 3 g kg^{-1} seeds)	83.9	77.8	68.6	62.7
T_2 : Calcium oxy chloride @ 3 g kg^{-1}seeds	86.1	79.3	73.1	65.3
T_3 : Sweet flag rhizome powder @ 10 g kg^{-1} seeds	84.2	77.1	68.0	62.3
S.Em ±	0.4	0.2	0.2	0.2
CD (1%)	1.3	0.6	0.6	0.7
Containers				
C_1 : Cloth bag	75.1	67.3	60.9	54.2
C_2 : Polythene bag	85.1	78.0	71.3	64.5
C_3 : Aluminium pouch	93.9	88.4	78.0	70.9
S.Em ±	84.8	77.9	70.8	63.2
CD (1%)	0.4	0.2	0.2	0.2



V_1 - *Bt*. Cotton cv. Bikaneri Nerma
V_2 - Non *Bt*. cotton cv. Sahana

T_0 - Thiram 75 % WDP @ 2 g kg^{-1} seeds
T_1 - Imidachloprid @ 3 g kg^{-1} seeds
T_2 - Calcium oxy chloride @ 3 g kg^{-1}seeds
T_3 - Sweet flag rhizome powder @ 10 g kg^{-1} seeds

C_1 - Cloth bag
C_2 - Polythene bag
C_3 - Aluminum pouch

Figure 1: Influence of varieties, treatments and containers on germination percentage of cotton seed

and free radicals. The chlorine molecules of calcium oxychloride bind lipid molecules at double bonds and prevent further oxidation of lipid (Basu,1993). Further, calcium oxychloride is reported to have antimicrobial property (Chitra, 1995) as evidenced with lower per cent seed infection. Similar beneficial effects of halogenation on higher germination were also reported by Vyakaranahal (2000) in sunflower Suneeta (2000) in sunflower, Sandya Rani (2002) in cotton, Basavegowda and Nanjareddy (2005) in groundnut and Amrutha *et al*. (2015).

Effect of containers on seed quality during storage

The seeds stored in moisture impervious containers are able retained the seed quality for longer period compared to moisture pervious containers under ambient storage conditions. The results revealed that seeds stored in aluminum pouches and polythene bags were superior in maintaining viability and vigour compared to the seed stored in cloth bag.

Among the containers, moisture content of cotton seed remained unchanged or slight fluctuations were noticed in aluminum foil pouches (7.30 to 7.48 %) and polythene bag (7.36 to 7.67 %) which may be due to moisture proof packing. Whereas seed moisture contentfluctuated (7.54 to 9.23 %) in cloth bag (Table 1) responding to the fluctuating relative humidity of the atmosphere due to its pervious nature (Vasudevan *et al*., 2014). The results are on par with findings of (Sandya Rani, 2002) and(Shivayogi, 2003) in cotton. Significantly, highest germination percentage, field emergence, speed of germination, shoot length, root length and seedling dry weight (68.03 %, 64.03%, 41.00, 10.87 cm, 16.71 cm and 70.9 mg) in Aluminum foil pouch were as lowest in cloth bag (54.93 %, 50.93%, 39.56, 9.75 cm, 15.00 cm and 54.2 mg) respectively (Table 1, 2, 3 and 4). This could be attributed to slower rate of deterioration in Aluminum foil pouch due to impervious nature of polythene layer with maintenance of low moisture content and due to better membrane integrity and increased availability of energy in the endosperm (Basu and Rudrapal, 1993). Whereas, in cloth bag seed moisture fluctuated with the change in ambient relative humidity. Such rapid loss of viability in cloth bag due to decrease in metabolic processes and the products of metabolism were sources for developing microflora.These results are in conformity with

(Malabasari, 2003) in cotton, (Maruthi *et al*., 2014) in bottle gourd and (Hareesh *et al*., 2014) in pigeon pea.From the experimental findings it can be concluded that *Bt* cotton seeds treated with $CaOCl_2$ @ 3 g kg^{-1}seedsandstored in aluminum pouches are better to maintain higher seed quality parameters up to nine months.

REFERENCES

Abdul-Baki, A. A. and Anderson, J. D. 1973. Vigour determination in soybean seed by multiple criteria.*Crop Sci.,***13**: 630-633.

Agrawal, P. K. 1974. Storage studies on maize seeds. *Bul. of Grain Technol.,***12**: 109-112.

Amrutha, N., Sarika, G., Umesha, Maruthi, J. B. Basavaraju, G. V. 2014. Effect of botanicals and insecticides seed treatment and containers on seed longevity of black gram under natural ageing conditions.*J. Applied and Natural Science*. **7 (1)**: 328-334.

Basavegowda andNanjareddy, Y. A. 2005. Effect of pre-sowing invigouration on seed quality parameters in rabi/summer groundnut.*J .Oilseeds Res*. **22**:249-254.

Basu, R. N. and Rudrapal.1993. Seed invigoration for extended storability.*Seed Research*.**5**: 217-230.

Basu, R. N. 1993. Seed invigouration for extended storability. *Seed Res.,* pp. 217-230.

Chitra, T. A. S. 1995. Seed quality problems and management strategies to improve sowing quality in cotton. *M.Sc. (Agri) Thesis,* Tamil Nadu Agril. Univ., Coimbatore, India.

Divya Shree, B., 2006. Evaluation of validity period of different oil seed crops stored at different locations. *M.Sc. (Agri) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka, India.

Doijode, S. D. 1988. Studies on vigour and viability as influenced by maturity in chilli (C. *annuum* L.).*Haryana J. Hort. Sci*. **17**: 94-96.

Hareesh, K. K., Shakuntala, N. M., Vasudevan, S. N. and Sangeeta I. Macha. 2014. Organic priming in pigeon pea-an ecofriendly approach for sustainable agriculture. *The Ecoscan.***6**: 237 – 243.

Hareesh, K. K., 2014. Studies on seed priming in pigeonpea and chickpea.*M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Raichur (India).

ISTA. 2006. International rules for seed testing. Seed Sci. and Technol., **27**: 27-31.

Maguire, J. D. 1962. Speeds of germination-aid selection and evaluation for seedling emergence and vigor.*Crop Science*.**2**: 176-177.

Malabasari, T. A. 2003. Studies on seed production techniques and storage potential in cotton hybrid DHB-105.*Ph.D Thesis,* Univ. of Agric. Sci., Dharwad, Karnataka, India.

Martuthi, K., Doddagoudar, S. R., Vasudevan, S. N., and GajendraKhidrapure. 2014. Effect of post harvest ripening duration on seed quality during storage in bottle gourd (*Lagenariasiceraria*). *The Ecoscan.***6**:209 – 215.

Panse, V. G. and Sukhatme, P. V. 1978. Statistical methods for agricultural workers, Indian Council of Agric. Res., New Delhi (India).

Pham L. G. and Ramegowda. 2007. Influence of seed coating with synthetic polymers and chemicals on seed quality and storability of hybrid rice. *Omonrice*.**15**: 68-74

Roberts, E. H. 1972. Loss of viability and crop yields. In: Viability of seeds (Ed. E.H. Roberts), Chapman Hall *Ltd*., London, p. 313.

Sandya Rani, G. M. 2002. Influence of seed treatment with chemicals and botanical on storability and field performance of fresh and aged hybrid cotton seeds.

Shakuntala, N. M., Vasudevan, S. N., Patil, S. B., Doddagoudar, S. R., Mathad, R. C. and Vijaykumar, D. K. 2012. Organic biopriming on seed vigour inducing enzyme in paddy - an alternative to inorganics.*The Ecoscan.***1**: 251-257.

Shivayogi, Y. Ryavalad. 2003.studies on delinting techniques and storability of hybrid cotton seeds. *M.Sc. (Agri) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka, India.

Suneeta S. 2000. Invigouration studies on hybrid sunflower KBSH-1, *M.Sc. (Agri) Thesis,* Univ. of Agric. Sci., Dharwad, Karnataka, India.

Tejashwini P. Kumar, Asha, A. M., Maruthi, J. B. and Vishwanath, K.2014. Influence of seed treatment chemicals and containers on seed quality of marigold during storage.*TheBioscan*. **9(3)**: 937-942

Vasudevan, S. N., Thimmanna, D., Doddagoudar, S. R., Rakesh C. Mathad., Shakuntala, N. M. and Sangeetha I. Macha. 2014. Storage behaviour of *Jatrophacurcus*L. seeds as influenced by moisture content storage container. *Karnataka J. Agric. Sci*. **27 (3)**: 345-347.

Vasudevan, S.N., Rajarajeshwari., Vijayakumar., Amaregouda, A. and Doddagoudar, S. R. 2015. Irradiation effects of seed quality and storability of chickpea genotypes. *Ecology, Environment and Conservation.***21(22)**: 801-806.

Vyakaranahal, B. S., Shekharagowda, M., Prabhakar, A. S. and Patil, S. A. 2000. Efficacy of halogens, plant products and fungicides on storage potentiality of sunflower restorer lines. *Karnataka J. Agric. Sci.* **13:** 36-45.

NATIONAL ENVIRONMENTALISTS ASSOCIATION

AND ITS OFFICIAL ORGAN

The Bioscan

An International Quarterly Journal of Life Science

Started in 1988, the National Environmentalists Association has been reorganized in 2006 and now is an association functioning with full vigour and new impetus to meet its objectives with the co-operation of like minded environment conscious academicians from different parts of the nation.

MEMBERSHIP OF THE ASSOCIATION

Any graduate having interest in environmental conservation and protection of nature and natural resources can be the member of the association.

To be the member of the association the application form given below should be duly filled up and sent to the Secretary of the association along with a demand draft of Rs. 750/- (After the 25% concession) for annual membership and Rs. 7500/- (After the 25% concession) for life membership.

FELLOWSHIP OF THE ASSOCIATION

The Association is awarding FELLOWSHIP to deserving academicians / researchers /scientists who are LIFE MEMBERS of the Association after reviewing their bio-data by the Fellows and the Executive Members of the association. The Fellows are privileged to write **F.N.E.A.** after their names **.**The prestigious Fellowship also includes a citation in recognition of their contribution to society in general and the endeavour for the noble cause of environment in particular.

AWARDS OF THE ASSOCIATION

The Association in its Seminars and Conferences provides the following category of awards on annual basis.

1. **The young scientists award** : It is given to the researchers below the age of 35 years.

2. **The senior scientists award** : It is awarded to the academicians above the age of 35 years.

3. **The best paper award**: It is awarded to the contributor of the Journal **The Bioscan** during the year.

4. **The best paper presentation award** : It is awarded to the scholar whose presentation is the best other than the young scientist category.

5. **The best oration award** : It is awarded to the scholar who delivered invited speech.

6. **The recognition award** : It is awarded to those senior scholars who have contributed to the subject through their continued research .

7. **The environmental awareness award** : It is awarded to those who, apart from their research contribution, have done commendable extension work for environmental betterment.

The number of recipients of award in each category will vary depending upon the recommendation of the panel of judges and the executive committee. The association has the provision to institute awards in the name of persons for whom a with desired sum is donated in consultation with the executive body.

PUBLICATION OF THE ASSOCIATION

In order to provide a platform to a vast group of researchers to express their views and finding of research as well as to promote the attitude of quality research among the scholars of younger generation the association publishes an international quarterly journal – **THE BIOSCAN (ISSN:0973-7049).** For the benefit of the potential contributors **instructions to authors** is given separately in this journal. However, the details regarding the journal and also the association can be seen on our website *www.thebioscan.in.*

Cont. ..... P. 1424