INTERACTION EFFECT OF SEED STORAGE CONTAINERS AND SEED TREATMENTS ON SEED QUALITY IN GROUNDNUT (*Arachis hypogea* L.) DURING STORAGE

***SAINI, ANURAG; PATEL, M. B.; PATEL, J. B.; COURMULE, SAGAR R. AND MANDEL, DEEPASHREE**

DEPARTMENT OF SEED SCIENCE AND TECHNOLOGY
COLLEGE OF AGRICULTURE
JUNAGADH AGRICULTURAL UNIVERSITY
JUNAGADH – 362 001, GUJARAT, INDIA

****EMAIL: anu06.tinku@gmail.com***

ABSTRACT

A laboratory experiment was conducted in factorial completely randomized design with three repetitions in the Laboratory of Department of Seed Science and Technology, Junagadh Agricultural University, Junagadh from 15th April to 20th December, 2014 to study the effect of different seed treatments on seed quality in groundnut [Arachis hypogea L.] during two storage periods (150 and 250 days of storage). With regards to different interaction, Pods stored in polyvinyl bag packing with vaccum and treated with methyl parathion with calcium chloride (T_8C_4) maintained lowest seed moisture per cent, pods stored in polyvinyl bag packing with vaccum and treated with methyl parathion with calcium chloride (T_8C_4) and in aluminum foil laminated bag treated with methyl parathion with calcium chloride (T_8C_3) maintained minimum bruchid infestation, while pods stored in aluminum foil laminated bag treated with malathion and stored in polyvinyl bag packing with vaccum treated with silica gel (T_4C_3 and T_6C_4) has the highest germination per cent and pods stored in aluminum foil laminated bag treated with methyl parathion with silica gel maintained (T_9C_3) the highest highest seedling dry weight (gm), vigour index mass, while pods stored in moisture vapour proof high density laminated polyvinyl bag treated with methyl parathion with calcium chloride (T_8C_1) and in polyvinyl bag packing with vaccum treated with methyl parathion (T_3C_4) maintained the highest seedling length (cm).

KEY WORDS: Bruchid infestation, groundnut, packing materials, quality, germination, seed vigour, storage period

INTRODUCTION

Among the oilseeds, groundnut [*Arachis hypogea* (L.)] is having vital role in the diet of rural and urban masses. Groundnut also known as peanut is considered as one of the important oilseed crops and grown throughout the world. Groundnut is an annual herb belonging to family *Fabaceae*. The crop is suitable for cultivation in the tropical regions. 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. During storage, number of biotic and abiotic factors influenced the storage

potential of seeds and results in gradual seed deterioration and ultimately death of the seeds (Kumar *et al.,* 2014). The extent of seed detoriation depends on species, seed containers, seed treatment, storage environment, duration of storage period and initial quality of stored seeds. The maintenance of seed quality during storage is most important challenging in the crop due to problem of quick loss of seed quality. Quality deteriorates in groundnut during storage due to fungal, insect or other pest infestation. Different chemicals can be used for protection of seeds. Due to toxicity nature of these products, they have been well used for large-scale storage, domestic purposes in rural areas. Plant powders have got antifeedant, repellant and deterrent properties. Being hygroscopic in nature, viability and vigour of seeds are known to be regulated by variations in seed containers, storage period, initial seed quality, packaging conditions and physiochemical factors *etc*. Seed containers or packaging materials are considered as one of the most important factors influencing longevity of seeds in storage in many field crops, in general, and groundnut in particular. Mandate of this experiment was to investigate the effect of storage containers and seed treatments on quality of groundnut seeds.

MATERIAL AND METHODS

The pods of groundnut cv. GG 20 were obtained from Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh. The production year of GG 20 pods was *kharif* – 2013 and moisture content was 6 to 8 per cent. Seed treatments were given in dry dressing and liquid form. Spinosad (T_1), Carbendazim (T_2), Methyl parathion (T_3), Malathion (T_4), Fenvalerate (T_5), Silica gel (T_6), Calcium chloride (T_7), combination of Methyl parathion with Calcium chloride (T_8) and Methyl parathion with Silica gel (T_9) available in the market were directly used as seed treatment along with control (T_{10}). Thereafter, the treated seeds (4 kg of each treatment) were packed in seed container comprised moisture vapour proof high density laminated polyvinyl bags (C_1), polyvinyl bags 700 gauge (C_2), aluminium foil laminated bag (C_3), polyvinyl bag packing with vaccum (C_4) and cloth bag (C_5). The seed storage containers kept under ambient storage condition for the period from 15th April to 20th December, 2014. The observations on seed moisture content (Agrawal, 1980), germination percentage (ISTA, 1976), seedling length (cm), seedling dry weight (gm) (Woodstock, 1976), vigour index mass (Abdul-Baki and Anderson, 1973), and bruchid infestation (%) were recorded after 150 and 250 days of storage of treated seeds. Statistical analysis of the data was worked out using factorial completely randomized block design (Snedecor and Cochran, 1988) and each character and treatments were compared by critical difference at five per cent and one per cent levels of significance.

RESULT AND DISCUSSION

Interaction effect on seed moisture per cent, germination percentage, seedling length, vigour index mass, seedling dry weight and bruchid infestation was found significant throughout the storage periods. Germination percentage, seedling length, vigour index mass and seedling dry weight decreased with increase in the storage period, whereas moisture content and bruchid infestation increased with increase in the storage period (Table 1).

Pods stored in cloth bag without treatment ($T_{10}C_5$) had retained significantly the highest seed moisture (5.85 % and 7.97 %) after 150 and 250 days of storage, respectively and significantly the lowest seed moisture (2.86 % and 3.10 %) was recorded by pods stored in polyvinyl bag packing with vaccum with methyl parathion and calcium chloride treatment (T_8C_4) and in polyvinyl bag packing with vaccum with methyl parathion treatment (T_3C_4) **a**fter 150 and 250 days of storage, respectively (Table 1). The positive effect of interaction of treatments and containers may be due to absence of moisture percolation in vaccum packing polyvinyl bag. Basavaraj *et al.* (2008) reported that onion seed treated by polymer coating mixed with thirum and stored in aluminium pouch recorded the lowest seed moisture percentage than same treated seeds stored in polythene bag at the end of 10th month of storage.

Pods stored in aluminum foil laminated bag treated with methyl parathion (T_4C_3) and in polyvinyl bag packing with vaccum treated with silica gel (T_6C_4) and in aluminum foil laminated bag with malathion treatment (T_4C_3) expressed significantly the highest germination (97.33 % and 98.00%) after 150 and 250 days of storage period, respectively, while pods stored in cloth bag with control ($T_{10}C_5$) displayed significantly the lowest germination percentage of 57.00 per cent and 54.00 per cent after 150 and 250 days of storage periods, respectively (Table 1). The beneficial effect may be due to less deleterious effect of insect and temperature and relative humidity in container. Rahman (2008) reported that groundnut seeds treated with *Bradyrhizobium* fertilization and stored in polythene bag showed the highest germination percentage over tin container.

Pods stored in moisture vapour proof high density laminated polyvinyl bag and treated with combination of methyl parathion and calcium chloride (T_8C_1) *and* in polyvinyl bag packing with vaccum and treated with methyl parathion (T_3C_4) expressed significantly the highest seedling length (17.21 cm and 16.44 cm) after 150 and 250 days of storage period, respectively, while pods stored in cloth bag without treatment ($T_{10}C_5$) displayed significantly the lowest seedling length (7.16 cm and 4.93 cm) after 150 and 250 days of storage, respectively (Table1). The positive effect of interaction may be due to less deterioration by fungal attack and inhibition of moisture fluctuation in vapour proof containers.

Pods stored in aluminum foil laminated bag with methyl parathion and silica gel (T_9C_3) expressed significantly the highest seedlings dry weight (1.88 gm and 1.36 gm) after 150 and 250 days of storage periods, respectively, while pods stored in moisture vapour proof high density laminated polyvinyl bag with the combination of methyl parathion and calcium chloride (T_8C_1) *and stored in* cloth bag without treatment ($T_{10}C_5$) displayed significantly the lowest seedlings dry weight (1.04 gm and 0.96 gm) after 150 and 250 days of storage periods, respectively (Table 1). This may be due to higher shoot and root area and vigorous seedling. Basavaraj *et al.* (2008) reported that onion seeds treated by polymer coating mixed with thirum and stored in aluminium pouch recorded dry weight than same treated seeds stored in polythene bag at the end of 10th month of storage.

Pods stored in aluminum foil laminated bag and treated by the combination of methyl parathion with silica gel (*T_9C_3*) expressed significantly the highest vigour index mass (179.84 and 133.12), while pods stored in cloth bag with control(*$T_{10}C_5$*) displayed significantly the lowest vigour index mass (49.82 and 63.00) after 150 and 250 days of storage, respectively (Table 1). This may be due to positive association with germination per cent and dry matter production.

The pods stored in polyvinyl bag packing with vaccum and treated with *methyl parathion with calcium chloride* (*T_8C_4*) *and stored in* aluminum foil laminated bag by the treatment of methyl parathion with calcium chloride *(T_8C_3)* reported significantly the *lowest* bruchid infestation (2.33% and 2.33%) *after 150 and 250 days of storage periods, respectively*, while the pods stored in cloth bag with control (*$T_{10}C_5$*) recorded the *highest* bruchid infestation (82.66% and 91.00%) after 150 and 250 days of storage periods, respectively (Table 1). The positive effect of interaction may be due to toxicity of chemical on oviposition of bruchid and less availability of oxygen for respiration of bruchids in seed container.

CONCLUSION

Based on the discussion, it can ce concluded that pods stored in polyvinyl bag packing with vaccum and treated with methyl parathion with calcium chloride (T_8C_4) maintained lowest seed moisture per cent, pods stored in polyvinyl bag packing with vaccum and treated with methyl parathion with calcium chloride (T_8C_4) and in aluminum foil laminated bag treated with methyl parathion with calcium chloride (T_8C_3) maintained minimum bruchid infestation, while pods stored in aluminum foil laminated bag treated with malathion and stored in polyvinyl bag packing with vaccum treated with silica gel (T_4C_3 and T_6C_4) has the highest germination per cent and pods stored in aluminum foil laminated bag treated with methyl parathion with silica gel maintained (T_9C_3) the highest highest seedling dry weight (gm), vigour index mass, while pods stored in moisture vapour proof high density laminated polyvinyl bag treated with methyl parathion with calcium chloride (T_8C_1) and in polyvinyl bag packing with vaccum treated with methyl parathion (T_3C_4) maintained the highest seedling length (cm).

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Table 1: Interaction effect of seed containers and seed treatments on seed moisture per cent, germination percentage, seedling length (cm), seedling dry weight (gm), vigour index mass and bruchid infestation during storage in groundnut.

Interactions	Moisture %		Germination %		Seedling Length (cm)		Seedling Dry Weight (gm)		Vigour Index mass		Bruchid Infestation	
	Storage period (Days)											
	150	250	150	250	150	250	150	250	150	250	150	250
$T_1 \times C_1$	4.10	7.05	93.33	92.00	14.78	13.24	1.28	1.26	117.80	117.11	6.33	11.00
$T_1 \times C_2$	4.62	7.36	96.33	96.66	15.33	14.16	1.12	1.07	109.05	105.52	8.00	7.00
$T_1 \times C_3$	4.45	4.78	97.00	97.33	14.23	11.51	1.08	1.08	105.71	105.44	11.00	11.00
$T_1 \times C_4$	4.77	4.78	96.33	95.66	14.46	13.53	1.67	1.11	163.08	109.83	5.00	10.33
$T_1 \times C_5$	4.70	7.92	91.66	87.00	15.04	12.54	1.41	1.15	124.10	106.04	3.33	11.00
$T_2 \times C_1$	3.72	7.15	91.00	93.33	12.75	12.39	1.21	1.11	111.98	102.12	8.33	6.00
$T_2 \times C_2$	5.45	4.53	96.66	95.33	15.72	15.22	1.31	1.27	124.45	122.26	8.00	8.00
$T_2 \times C_3$	4.63	6.64	95.66	97.33	14.19	12.81	1.60	1.10	156.79	108.17	8.00	84.00
$T_2 \times C_4$	5.49	4.77	96.33	96.00	15.79	13.32	1.40	1.08	134.62	106.16	2.66	3.00
$T_2 \times C_5$	4.51	8.84	91.33	88.00	15.33	12.86	1.42	1.14	124.18	104.74	7.33	15.67
$T_3 \times C_1$	3.79	7.64	95.33	95.33	14.56	12.90	1.66	1.26	157.16	122.90	3.33	7.67
$T_3 \times C_2$	4.73	5.10	94.33	94.00	16.31	15.10	1.41	1.16	132.05	111.73	3.66	3.00
$T_3 \times C_3$	3.94	5.69	96.33	97.00	14.43	13.38	1.56	1.21	153.92	118.98	8.00	4.67
$T_3 \times C_4$	5.49	3.10	95.66	96.00	16.86	16.44	1.07	1.07	103.74	103.77	3.33	3.00
$T_3 \times C_5$	4.52	7.62	93.33	93.66	16.06	14.68	1.50	1.16	142.13	108.25	3.33	3.00
$T_4 \times C_1$	3.67	6.31	96.33	96.33	13.53	12.94	1.60	1.20	155.36	115.60	4.33	7.67
$T_4 \times C_2$	4.72	5.01	96.00	95.66	15.86	14.71	1.48	1.23	142.60	119.96	3.33	18.00
$T_4 \times C_3$	3.98	4.69	97.33	98.00	16.14	15.97	1.35	1.14	132.34	110.61	5.00	7.67
$T_4 \times C_4$	5.54	4.94	94.66	94.66	15.06	15.06	1.58	1.13	150.21	108.76	7.66	9.00
$T_4 \times C_5$	4.49	7.30	94.66	93.00	16.40	14.43	1.26	1.07	117.49	101.73	4.33	31.67
$T_5 \times C_1$	3.80	7.32	93.66	95.00	14.61	13.08	1.69	1.26	161.50	121.62	8.66	2.67
$T_5 \times C_2$	4.72	4.28	96.00	95.33	14.39	11.74	1.23	1.18	117.48	114.88	5.00	7.00
$T_5 \times C_3$	4.89	4.79	96.33	96.33	14.90	11.69	1.40	1.08	138.12	106.11	4.33	8.67

T_5 x C_4	5.01	4.78	95.00	92.00	15.69	15.30	1.53	1.10	143.02	105.14	5.33	7.67
T_5 x C_5	4.39	7.72	87.00	85.33	14.79	14.61	1.59	1.28	135.66	111.31	5.33	2.67
T_6 x C_1	3.68	7.96	96.00	95.66	15.83	11.88	1.36	1.11	131.41	109.47	6.33	4.67
T_6 x C_2	4.41	4.54	94.00	96.33	14.86	13.50	1.87	1.28	175.29	120.65	2.66	4.00
T_6 x C_3	4.19	5.41	97.00	95.66	14.46	13.46	1.18	1.23	116.34	120.04	8.00	3.67
T_6 x C_4	5.54	4.89	97.33	96.33	15.70	12.51	1.50	1.19	145.84	116.93	6.00	3.67
T_6 x C_5	4.46	7.96	96.00	92.33	15.92	15.39	1.39	1.18	128.58	113.63	5.33	3.67
T_7 x C_1	4.60	7.73	95.33	95.33	15.23	13.55	1.36	1.18	129.84	114.77	4.33	3.67
T_7 x C_2	4.59	5.32	93.33	92.33	14.79	14.70	1.77	1.35	173.22	127.52	8.00	80.00
T_7 x C_3	3.96	5.70	97.00	96.00	15.74	14.64	1.72	1.22	168.59	118.99	6.66	3.33
T_7 x C_4	5.79	4.73	84.00	85.00	15.05	14.25	1.35	1.15	113.95	96.62	3.33	17.00
T_7 x C_5	4.30	7.78	94.66	88.00	13.61	13.43	1.47	1.15	132.40	107.54	4.00	8.33
T_8 x C_1	4.11	7.24	96.00	97.33	17.21	12.47	1.04	1.02	179.78	102.27	6.00	3.67
T_8 x C_2	4.69	4.61	92.66	92.33	14.72	12.96	1.65	1.20	151.33	109.89	4.33	6.00
T_8 x C_3	3.86	3.70	96.33	95.33	14.40	11.21	1.53	1.15	146.64	111.14	5.00	2.33
T_8 x C_4	2.86	4.86	95.66	91.66	15.30	14.70	1.37	1.20	125.00	115.43	2.33	4.00
T_8 x C_5	4.77	7.97	93.33	88.00	14.49	14.36	1.44	1.18	127.71	110.42	8.00	3.00
T_9 x C_1	4.17	7.60	95.33	92.33	14.68	12.36	1.36	1.08	124.82	102.94	4.33	6.00
T_9 x C_2	4.79	4.68	88.66	89.33	16.37	14.82	1.57	1.22	140.71	108.41	4.33	6.33
T_9 x C_3	3.87	3.85	96.66	96.00	14.44	13.15	1.88	1.36	179.84	133.12	8.66	5.00
T_9 x C_4	5.45	4.99	96.00	95.66	16.67	13.30	1.54	1.06	149.06	103.08	5.33	2.67
T_9 x C_5	4.54	6.93	88.66	85.33	14.32	13.29	1.48	1.08	125.13	95.82	7.33	7.00
T_{10} x C_1	3.65	6.69	95.33	95.33	15.32	14.96	1.36	1.11	129.60	106.11	8.33	9.67
T_{10} x C_2	4.81	5.50	91.00	88.33	14.62	12.78	1.62	1.20	143.56	108.16	5.00	7.67
T_{10} x C_3	4.74	4.54	96.66	95.66	15.58	14.65	1.47	1.10	144.01	108.43	4.33	9.00
T_{10} x C_4	5.31	5.08	95.66	92.00	15.78	14.11	1.56	1.06	144.53	101.72	11.66	54.33
T_{10} x C_5	5.85	7.97	57.00	54.00	7.16	4.93	1.10	0.96	49.82	63.00	82.67	91.00
S.Em±	0.16	0.35	1.42	1.63	0.53	0.51	0.041	0.04	4.48	4.26	0.45	0.55
CD @ 5%	0.46	0.98	4.00	4.58	1.51	1.43	0.116	0.11	12.59	11.99	1.26	1.56

[MS received: July 11, 2015] ***[MS accepted: July 27, 2015]***