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**Vijaya Geetha V**
Assistant Professor, Oilseeds Research Station, TNAU, Tindivanam, Tamil Nadu, India

**PC Prabu**
Assistant Professor, Oilseeds Research Station, TNAU, Tindivanam, Tamil Nadu, India

**S Thiruvarassan**
Assistant Professor, Oilseeds Research Station, TNAU, Tindivanam, Tamil Nadu, India

**M Bhaskaran**
Professor and Head, RRS, TNAU, Tirur, Tamil Nadu, India

**Corresponding Author:**
**Vijaya Geetha V**
Assistant Professor, Oilseeds Research Station, TNAU, Tindivanam, Tamil Nadu, India

# Assessment of suitable seed treatment for improving storage potential of groundnut and sesame seeds

**Vijaya Geetha V, PC Prabu, S Thiruvarassan and M Bhaskaran**

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**Abstract**
Groundnut and sesame are the economic commercial crops of India and need special attention for extended storage life due to its high demand and lesser multiplication ratio. The storage of oil seed is most critical both due to the presence of glycerides and amenability to fungal infections. The freshly harvested seeds of groundnut cv. TMV 13 obtained from Oilseeds Research Station, Tindivanam formed the base material for the study. The experiment was conducted at Oilseeds Research Station, Tindivanam during 2016-2017. The groundnut pods with initial moisture content of 8.0 per cent were conditioned to various treatments *viz.*, T1- Control; T2 – Seeds treated with Halogen Vapour @3g/kg of seed; T3 – Seeds treated with Halo Polymer @3ml/kg of seed. After treating the seeds, the seeds were dried to the moisture content of eight per cent and packed in Super Grain Bag. Seeds were evaluated at bimonthly interval upto 6 six months of storage and from seventh month onwards it has been evaluated at monthly basis for its quality parameters *viz.*, Germination Percentage, Root length (cm), Shoot length (cm), Dry matter production (g 10 seedling $^{-1}$), Vigour index, Electrical Conductivity (dsm$^{-1}$), Oil Content (Per cent) and Field Emergence (%). The groundnut as well as sesame seed treated with Halo polymer @3 ml/kg of seeds stored in super grain bag maintained better vigour and viability upto 10 months compared to other treatments under ambient condition. The groundnut maintained 53% and sesame maintained 85% at the end of ten months of storage.

**Keywords:** Groundnut, sesame, halo polymer, halogen vapour, storage, super bag, seed treatment

## Introduction
India is a paradise for oilseed crops. No other country has its range of perennial and annual oilseeds. In terms of area, India ranks first in groundnut, sesame, linseed, safflower, niger and castor. Oilseed crops have been the backbone of agricultural economy of India from time immemorial. Oils extracted from plants have been used since earliest times and have been exploited in many ways. Total edible oil production in 2012-13 is likely to increase to 7.3 million tons, 3 percent more than the previous year. Seed aging during storage is an inevitable phenomenon, but the degree and speed of decline in seed quality depend strongly, beside storage conditions, on plant species stored and initial seed quality (Elias and Copeland, 1994; Balesevic *et al*., 2005) [5, 3]. Seed being a living entity, deterioration beyond physiological maturity is inevitable and will be pronounced when seeds are stored under hostile conditions. Although, ageing of seeds cannot be arrested completely, when they are stored under ambient condition, it can however, be controlled to an appreciable extent by adoption of suitable storage technologies. The physiological ageing in seed is accelerated by the hostile environment like increased temperature and relative humidity. Developing controlled storage condition might solve this problem, but it is often not feasible for storing bulk quantity of seeds at least for the present. For this purpose, various physical enhancement techniques are followed in the seed industry such as fungicidal treatments, halogenation and pelleting treatments. With these in background, studies have been undertaken in Groundnut TMV 13 and sesame cv. TMV 7 to study the influence of physical seed enhancement techniques on storability.

## Materials and Methods
Freshly harvested seeds of groundnut TMV 13 and Sesame TMV 7 obtained from Oilseeds Research Station, Tindivanam formed the base material for the study. The seeds were subjected to the following treatments

T1- Control
T2 – Seeds treated with Halogen Vapour @3g/kg of seed
T3 – Seeds treated with Halo Polymer @3ml/kg of seed

After treating the seeds, the seeds were dried to the moisture content of eight per cent and packed in Super Grain Bag. Seeds were evaluated at bimonthly interval upto 6 six months of storage and from seventh month onwards it has been evaluated at monthly basis for its quality parameters *viz*., Germination Percentage (ISTA,1999) [10], Root length (cm), Shoot length (cm), Dry matter production (g 10 seedling $^{-1}$), Vigour index (Abdul-Baki and Anderson, 1973) [2], Electrical Conductivity (dsm$^{-1}$) (Presley, 1958**)** [12] and Field Emergence (%).

## Result and Discussion

### Groundnut

Seed moisture content is a crucial factor that influences the storability of seed. The effect of seed moisture content on longevity can be quantified (Ellis and Roberts, 1980) [6]. In the present study, a steady increase in moisture content was observed with advance in period of storage up to 6 months of storage. After six months, the moisture content reduced due to dry weather prevailed during that time, the. The halogen vapour treated seed registered 8.26 per cent of moisture, whereas the control seed registered 8.30 per cent (Table.1).The decline in germination occur during storage was normally attributed to the depletion of food reserves and synthetic activity. In the present study the variation due to germination within the treatment was significant (Table.1). The seedling vigour is the most relevant expression of the seed quality (Heydecker, 1972) [8]. Among the treatments the vigour index was the lowest with untreated seeds (2163) and the highest with halo polymer treatment. (2591). within the duration the values reduced from 3529 (initial) to 1279 (tenth month) (Table.2). Drymatter production showed significant difference for treatment and period of storage. (Table.2). Drymatter production in the seedlings was the manifestation of the physiological efficiency of the germinating seed, which depends on the seed vigour (Heydecker, 1973) [9]. Drymatter production decreased gradually with increase in storage period from 3.41 g ($P_0$) to 2.62 g ($P_{10}$). The seeds treated with halo polymer recorded higher drymatter production of 3.06 g, whereas control registered 2.92g. The electrical conductivity values of seed leachates differed significantly due to period of storage (Table.3). The Electrical Conductivity increases with increase in storage period from 0.125 dsm$^{-1}$ to 0.529 dsm$^{-1}$. The increase in electrical conductivity with the advancement of storage period was reported by Paramasivam, 2005 [11] in groundnut. The field emergence were highest at Halo polymer treatment (84%) compared to control (78.1%). The field emergence potential is considered to be an important parameter for assessing the potentiality of seeds to perform better under field conditions. The present study revealed that, as the storage period advanced field emergence potential reduced gradually, irrespective of seed moisture contents and packaging materials (Gomathi, 2009) [6].

### Sesame

Copeland and McDonald (1995) [4] also reported that moisture content of seed plays major role in determination of seed storability. It influences most of the physical and physiological seed properties and therefore moisture content is of interest when estimating important seed quality traits. Hence, Roberts (1973) [13] reported that longevity of seed increase in a quantifiable manner with decrease in moisture content. Fluctuation and significant difference in seed moisture content was observed due treatments and period of storage. Minimum fluctuation was seen among the treatments (Table.4). Halo polymer treatment registered 8.15% which was on par with Control seeds (8.15%). The germination per cent differed significantly for treatments, Period of storage and their interactions (Table.4). The germination percentage is an excellent indicator of growth potential and survival of seeds, irrespective of factors responsible for loss of viability (Abdalla and Roberts, 1969) [1]. Among the treatments, seeds treated with halo polymer registered the maximum germination of 88.3 per cent. The observations on the evaluated vigour parameters *viz.*, root and shoot length, dry matter production and vigour index were in line with germination per cent, which also decreased with increase in storage period, irrespective of packaging materials. The relative length of root and shoot of germinating seedling would predict their subsequent growth and performance (Woodstock and Comb, 1964) [4]. Seedling length and dry matter production of the seedling are the manifestations of the physiological efficiency of the germinating seeds which depends on the seed vigour (Heydecker, 1973) [9] and seedling growth has been regulated as a good index to measure the vigour of the seed (Abdul-Baki and Aderson, 1973) [2]. The results of computed vigour index showed significant differences with respect to treatments, Period of storage and their interactions (Table.5). The differences in the electrical conductivity values of seed leachates were significant due to Treatments, Period of Storage and its interaction. As the storage period progressed, there was a significant increase in electrical conductivity of seed leachates from 0.075 (P0) to 0.208 dSm$^{-1}$ (P10), irrespective of treatments. (Table.5). Dry matter production of seedlings was significantly influenced by Seed treatment, period of storage and their interactions (Table.6). The seeds treated with Halo Polymer registered the highest field emergence (84.5per cent) and the lowest emergence (80.3 per cent) recorded in untreated control.

**Table 1:** Effect of storage treatments on Moisture Content and Germination Percentage in Groundnut TMV 13

| | Moisture Content | | | | | | | | | Germination Percentage | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment** | **P0** | **P2** | **P4** | **P6** | **P7** | **P8** | **P9** | **P10** | **Mean** | **P0** | **P2** | **P4** | **P6** | **P7** | **P8** | **P9** | **P10** | **Mean** |
| Control | 8.1 | 8.6 | 8.8 | 8.7 | 8.4 | 8.1 | 8.1 | 8.0 | 8.35 | 95 | 92 | 89 | 85 | 74 | 66 | 59 | 47 | 75.9 |
| Halogen Vapour | 8.4 | 8.8 | 9.1 | 9.0 | 8.8 | 8.4 | 8.3 | 8.2 | 8.63 | 97 | 94 | 91 | 89 | 78 | 70 | 63 | 53 | 79.4 |
| Halo polymer | 8.3 | 8.6 | 8.9 | 8.7 | 8.5 | 8.3 | 8.2 | 8.1 | 8.45 | 96 | 93 | 90 | 87 | 76 | 68 | 61 | 48 | 77.4 |
| Mean | 8.27 | 8.67 | 8.93 | 8.80 | 8.57 | 8.27 | 8.20 | 8.10 | 8.48 | 96.0 | 93.0 | 90.0 | 87.0 | 76.0 | 68.0 | 61.0 | 49.3 | 77.5 |
| | P | | T | | PxT | | | | | P | | T | | PxT | | | | |
| | 0.041 | | 0.025 | | 0.073 | | | | | 0.499 | | 0.305 | | 0.864 | | | | |
| CD(0.05) | 0.084 | | 0.051 | | 0.145 | | | | | 0.999 | | 0.612 | | 1.730 | | | | |

**Table 2:** Effect of storage treatments on Vigour index and Dry Matter Production (mg 10 seedling$^{-1}$) in Groundnut TMV 13

| | Vigour Index | | | | | | | | | Dry Matter Production (mg 10 seedling$^{-1}$) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment** | **P0** | **P2** | **P4** | **P6** | **P7** | **P8** | **P9** | **P10** | **Mean** | **P0** | **P2** | **P4** | **P6** | **P7** | **P8** | **P9** | **P10** | **Mean** |
| Control | 3306 | 2972 | 2537 | 2193 | 1769 | 1379 | 1109 | 672 | 1890 | 3.31 | 3.25 | 3.13 | 3.00 | 2.69 | 2.36 | 2.18 | 1.79 | 2.71 |
| Halogen Vapour | 3434 | 3093 | 2757 | 2412 | 2020 | 1589 | 1273 | 901 | 2098 | 3.42 | 3.36 | 3.22 | 3.10 | 2.91 | 2.69 | 2.35 | 2.05 | 2.89 |
| Halo polymer | 3379 | 3032 | 2691 | 2349 | 1832 | 1476 | 1183 | 763 | 1990 | 3.36 | 3.28 | 3.16 | 3.06 | 2.81 | 2.48 | 2.25 | 1.88 | 2.79 |
| Mean | 3373 | 3032 | 2661 | 2317 | 1872 | 1480 | 1187 | 776 | 1992 | 3.36 | 3.30 | 3.17 | 3.05 | 2.80 | 2.51 | 2.26 | 1.91 | 2.80 |
| | P | | T | | PxT | | | | | P | | T | | PxT | | | | |
| | 13.790 | | 8.445 | | 23.886 | | | | | 0.018 | | 0.011 | | 0.031 | | | | |
| CD(0.05) | 27.582 | | 16.891 | | 47.774 | | | | | 0.037 | | 0.023 | | 0.064 | | | | |

**Table 3:** Effect of storage treatments on Electrical Conductivity (dSm$^{-1}$) and Field Emergence Percentage in Groundnut TMV 13

| | Electrical Conductivity (dSm$^{-1}$) | | | | | | | | | Field Emergence Percentage | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment** | **P0** | **P2** | **P4** | **P6** | **P7** | **P8** | **P9** | **P10** | **Mean** | **P0** | **P2** | **P4** | **P6** | **P7** | **P8** | **P9** | **P10** | **Mean** |
| Control | 0.127 | 0.159 | 0.196 | 0.237 | 0.303 | 0.45 | 0.52 | 0.635 | 0.328 | 95 | 92 | 87 | 80 | 74 | 56 | 40 | 18 | 67.8 |
| Halogen Vapour | 0.125 | 0.153 | 0.193 | 0.225 | 0.294 | 0.432 | 0.486 | 0.587 | 0.312 | 96 | 94 | 90 | 84 | 78 | 61 | 48 | 29 | 72.5 |
| Halo polymer | 0.126 | 0.155 | 0.195 | 0.228 | 0.298 | 0.396 | 0.498 | 0.62 | 0.315 | 95 | 93 | 89 | 81 | 76 | 58 | 42 | 25 | 69.9 |
| Mean | 0.126 | 0.156 | 0.195 | 0.230 | 0.298 | 0.426 | 0.501 | 0.614 | 0.318 | 95.3 | 93.0 | 88.7 | 81.7 | 76.0 | 58.3 | 43.3 | 24.0 | 70.0 |
| | P | | T | | PxT | | | | | P | | T | | PxT | | | | |
| | 0.003 | | 0.002 | | 0.007 | | | | | 0.771 | | 0.473 | | 1.335 | | | | |
| CD(0.05) | 0.008 | | 0.005 | | 0.014 | | | | | 1.543 | | 0.945 | | 2.672 | | | | |

**Table 4:** Effect of storage treatments on Moisture Content and Germination Percentage in Sesame TMV 7

| | Moisture Content (%) | | | | | | | Germination Percentage | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment** | **P0** | **P2** | **P4** | **P6** | **P8** | **P10** | **Mean** | **P0** | **P2** | **P4** | **P6** | **P8** | **P10** | **Mean** |
| Control | 8.1 | 8.2 | 8.2 | 8.3 | 8.1 | 8.0 | 8.15 | 87 | 86 | 85 | 83 | 82 | 81 | 84.0 |
| Halogen Vapour | 8.0 | 8.1 | 8.2 | 8.2 | 8.1 | 8.1 | 8.12 | 89 | 88 | 87 | 85 | 84 | 83 | 86.0 |
| Halo polymer | 8.0 | 8.2 | 8.2 | 8.3 | 8.2 | 8.0 | 8.15 | 92 | 91 | 89 | 87 | 86 | 85 | 88.3 |
| Mean | 8.03 | 8.17 | 8.20 | 8.27 | 8.13 | 8.03 | 8.14 | 89.3 | 88.3 | 87.0 | 85.0 | 84.0 | 83.0 | 86.1 |
| | P | | T | | PxT | | | P | | T | | PxT | | |
| | 0.035 | | 0.024 | | 0.061 | | | 0.371 | | 0.261 | | 0.642 | | |
| CD(0.05) | 0.071 | | 0.050 | | 0.124 | | | 0.744 | | 0.526 | | 1.288 | | |

**Table 5:** Effect of storage treatments on Vigour index and Dry matter production (mg 10 seedling$^{-1}$) in Sesame TMV 7

| | Vigour Index | | | | | | | Dry matter Production | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment** | **P0** | **P2** | **P4** | **P6** | **P8** | **P10** | **Mean** | **P0** | **P2** | **P4** | **P6** | **P8** | **P10** | **Mean** |
| Control | 1470 | 1367 | 1318 | 1228 | 1156 | 1085 | 1271 | 38.2 | 37.2 | 36.5 | 35.6 | 34.5 | 32.9 | 35.82 |
| Halogen Vapour | 1540 | 1443 | 1392 | 1309 | 1226 | 1187 | 1350 | 39.7 | 38.8 | 38.2 | 37.5 | 36.6 | 34.5 | 37.55 |
| Halo polymer | 1665 | 1556 | 1504 | 1418 | 1350 | 1275 | 1461 | 40.6 | 39.3 | 38.5 | 37.8 | 37.0 | 35.7 | 38.15 |
| Mean | 1558 | 1456 | 1405 | 1319 | 1244 | 1182 | 1361 | 39.50 | 38.43 | 37.73 | 36.97 | 36.03 | 34.37 | 37.17 |
| | P | | T | | PxT | | | P | | T | | PxT | | |
| | 7.415 | | 5.243 | | 12.844 | | | 0.142 | | 0.100 | | 0.247 | | |
| CD(0.05) | 14.833 | | 10.488 | | 25.691 | | | 0.286 | | 0.202 | | 0.495 | | |

**Table 6:** Effect of storage treatments on Electrical Conductivity (dSm$^{-1}$) and Field Emergence Percentage in Sesame TMV 7

| | Electrical Conductivity (dSm$^{-1}$) | | | | | | | Field Emergence Percentage | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment** | **P0** | **P2** | **P4** | **P6** | **P8** | **P10** | **Mean** | **P0** | **P2** | **P4** | **P6** | **P8** | **P10** | **Mean** |
| Control | 0.076 | 0.087 | 0.098 | 0.121 | 0.145 | 0.216 | 0.124 | 84 | 82 | 82 | 80 | 78 | 76 | 80.3 |
| Halogen Vapour | 0.075 | 0.085 | 0.095 | 0.116 | 0.137 | 0.208 | 0.119 | 86 | 84 | 84 | 82 | 81 | 79 | 82.7 |
| Halo polymer | 0.075 | 0.086 | 0.094 | 0.113 | 0.132 | 0.201 | 0.117 | 88 | 86 | 86 | 84 | 82 | 81 | 84.5 |
| Mean | 0.075 | 0.086 | 0.095 | 0.116 | 0.138 | 0.208 | 0.120 | 86.0 | 84.0 | 84.0 | 82.0 | 80.3 | 78.7 | 82.5 |
| | P | | T | | PxT | | | P | | T | | PxT | | |
| | 0.044 | | 0.061 | | 0.075 | | | 0.495 | | 0.350 | | 0.858 | | |
| CD(0.05) | 0.089 | | 0.063 | | 0.154 | | | 0.991 | | 0.701 | | 1.717 | | |

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