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Research Article

Biochemical Assessment of Indian Mustard (*Brassica juncea*) In Different Storage Containers

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ABSTRACT

The present investigation was carried out to evaluate the mustard seed quality under different storage conditions. Indian mustard (*Brassica juncea* L.) variety TAM-108-1, seed stored for eighteen months in tin container, aluminium foil, polythene bag and cloth bag at room temperature. The initial oil content percentage of seed was 40.76 % but after eighteen months (540 days) in tin container, aluminium foil, polythene bag, cloth bag it was decreased with time period to 35.23 %, 33.66 %, 31.12 %, 28.25 %. The initial protein content percentage in seed was 41.88 % however, after storage for eighteen months in tin container, aluminium foil, polythene bag and cloth bag it was declined to 36.43 %, 32.52 %, 30.64 %, 27.62 %. Storage condition affects the normal seed deterioration, oil content and protein content. The study revealed that for seed storage tin container was better significant than aluminium foil, polythene bag, cloth bag for mustard seeds.

Keywords: Mustard, Oil, Protein, Seed quality, Storage container, Tin

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INTRODUCTION

Indian mustard [*Brassica juncea* (L.) Czern & Coss.] is one of the most excellent oilseed crop of India. It is the second one biggest oilseeds crop in India after soybean. It money owed for nearly 30 % of the entire manufacturing and contributes about 27 % to safe to eat oil of the united states (Sutariya et al., 2011). The oilseed plant of *Brassica* species usually called as rapeseed-mustard, that is the most crucial Rabi oilseed crop in agriculture. Seed satisfactory is a complex trait this is decided through the genetics, bodily, physiological and fitness properties of a seed (Neves et al., 2016). It is the vital source of fit to be eaten oil and meal as nicely. Nutritional houses of mustard oil are

determined via the fatty acid profile which incorporates palmitic, stearic, oleic, linoleic, linolenic, eicosenoic and erucic acids. Each linoleic and linolenic acids are crucial fatty acids; however, less than three % linolenic acid is favoured for oil balance. A balanced ratio of those important fatty acids in mustard oil makes it appropriate for edible functions (Singh et al., 2014).

Mustard seed meal is commonly used as animal feed but can also be applied for manufacturing of value-introduced merchandise (Bala and Singh, 2012). The satisfactory of seed is comprised genetic and mechanical purity, seed germination, power and seed health (Prasad et al., 2017). In any agriculture field seed nice and the herbal seed deterioration of stored seeds

poses a sizeable clinical challenge of global concern. Various biotic and abiotic elements, along with crop genotype, initial seed excellent, storage boxes, and storage conditions, make contributions to seed deterioration under wrong storage situations. Among these elements, storage temperature and moisture content material are pivotal, with moisture content commonly exerting a greater stated have an effect on than temperature (Ray and Bordolui, 2022).

Seed is an essential issue of agricultural production in India. In any agriculture the seed quality is the muse of a successful crop manufacturing programme. The seed pleasant plays an essential role in the agricultural production in addition to in countrywide financial system. Therefore the best seed first-rate is necessary to enhance the production and productivity. Those properties are in flip influenced through the agro-ecological conditions inside the seed production subject, seed handling and processing, garage conditions and storage period (Shelar et al., 2008). Seed meal of mustard is a rich supply of protein (32-40 %) additionally. Mustard protein has excessive nutritive value in comparison to different vegetable merchandise because of its excessive organic cost. The seed meal of mustard also has flavonoids, tocopherols, ascorbic acid etc. which show off antioxidant homes. Antioxidant compounds may additionally characteristic as loose radical scavengers, complex of pro-oxidant metals, decreasing agent and quenchers of singlet oxygen formation (Andlauer and Furst, 1998).

Storage durability may range from six months (generally for maize, soybean and sunflower), up to 20 months or longer if the seeds are to be carried over. Sturdiness of seed in storage is influenced by the initial high-quality of saved seed in addition to storage situations. Irrespective of preliminary seed first-class, destructive storage conditions, particularly air temperature and air relative humidity, contribute to acceleration of seed deterioration in storage. as a result, it's tough to assess the powerful storage period because the storability of the seed is a function of initial seed first-rate and the garage situations (Wych, 1988; Fabrizius et al., 1999; Heatherly and Elmore, 2004). Types of containers also regulate temperature, relative humidity and seed moisture contents. High temperature, relative humidity and moisture in the storage environment appear to be key factors involved in deterioration of seed quality. Loss of germination capacity is the final manifestation of seed deterioration. So, the present study was undertaken to identify the best storage container for storing mustard seed (*Brassica juncea* L.) variety TAM-108-1.

MATERIAL AND METHODS

The experiment was conducted at the laboratories of Department of Botany, RTMNU, Nagpur. This study was conducted to evaluate the mustard seed quality under different storage conditions. The seed of Indian mustard (*Brassica juncea* L.) variety TAM-108-1 which was stored in four different storage condition i.e. tin container, aluminium foil, polythene bag, and cloth bag and period of storage T1 (0 day), T2 (90 days), T3 (180 days), T4 (270 days), T5 (360 days), T6 (450 days) and

T7 (540 days) at the room temperature for 18 months (540 days) at room temperature. Seeds were collected from P.K.V, Nagpur. Seeds were used for the determination oil content and protein content. The experiment was statistically analyzed by using factorial design CRD (Completely Randomized Design). During the storage period, seed samples were taken after three months (90 days) from each container for biochemical observation of two parameters determination oil content and protein content.

Determination of Oil Content (%):

Soxhlet extraction method (Sadasivam and Manickam 2008):

Principle: Oil from a known quantity of seed is extracted with petroleum ether. It is then distilled off completely, dried, the oil weighed and the % of oil is calculated.

Materials: Petroleum ether, Whatman No.2 filter paper, absorbant cotton, soxhlet apparatus.

Procedure: Piece of filter paper was folded in such way to hold the dried powder of algae. This packet (thimble) was left open at the top. The weight of thimble without material was taken. Weight of thimble with material was taken. Thimble kept in the butt tubes of the soxhlet apparatus. Extraction was done with petroleum solvent for 8-10 hr. by gentle heating. After completion of extraction, it allowed to cool and dismantled extraction flask. Thimble was taken out from butt tube and kept in oven. Weight was taken until constant weight recorded.

Calculation: Oil in ground sample% = $\frac{\text{Weight of oil (g)}}{\text{Weight of sample (g)}} \times 100$.

Determination of Protein Content (%):

Total protein content in seed was determined by Micro Kjeldahl's Method (Saez- Plaza, 2013). The 1gm of properly ground to fine powder of seed sample was weighed and transferred into a micro-Kjeldahl's digestion 100 ml flask followed by 5ml concentrated sulphuric acid + 5 ml Hydrogen peroxide. It was then digested at higher temperature (about 40 minutes) on burner till the solution become, colourless. It was then subjected to cooling under tap water. The total volume of digested solution was made to 50 ml with distilled water. Place a conical flask with 10 ml Boric acid. Pipette out 10 ml of Boric acid solution into 100 ml beaker containing mixed indicator, the beaker was placed below the condenser so that the tip of the condenser deeps in the solution. 5 ml digested solution and 5 ml of NaOH was added to distillation apparatus. Apparatus was washed with 2 ml water. Mixture was steam distilled until 75 ml distilled was collected. The distillate was titrated with standard HCl up to appearance of violet colour. Blank was determined using same quantity of reagents and same digestion, distillation and titration. The percentage of protein was determined by the nitrogen protein conversion ratio by using the factor 6.25 for mustard seed.

Weight of sample in gm =W1, Volume digest made = 50 ml,

The volume taken for distillation = 5 ml,

Standard HCl required for sample titration =V1,

Standard HCl required for blank =V2

$$N \% = \frac{(V1-V2) \times \text{Norm. of HCL} \times 0.014 \times 50/5 \times 100}{W1}$$

$$\text{Protein \%} = N \% \times 6.$$

RESULT AND DISCUSSION

In the present study of oil content of mustard seed stored in different containers have presented in table 1. In mustard variety TAM-108-1, the oil content percentage significantly decreased with increase in storage period. The rate of loss in oil content percentage varied with the type of container used. The initial oil content percentage of the seed was (40.76 %) but after the storage 18 months (540 days) in tin container, aluminium foil, polythene bag, cloth bag it was declined. Seeds stored in Tin showed significantly higher oil content percentage (35.23 %) as compared to those stored in Aluminium foil (33.66 %), Polythene bag (31.12 %) and Cloth bag (28.25 %) up to 540 days (T7) days of the storage. Among the containers Tin showed significantly higher mean of oil content percentage (37.34 %) as compared to Aluminium foil (35.49 %), Polythene bag (34.22 %) and Cloth bag (32.49 %) throughout the storage period. Similar findings were reported by Branimir S. et al. (2007) in maize, soybean and sunflower plants during two types of storage conditions which differ in air temperature and humidity.

The protein content of mustard seed stored in different containers have presented in table 2. In mustard variety TAM-108-1, the protein content percentage significantly decreased with increase in storage period. The rate of loss in protein content percentage varied with the type of container used. The initial protein content percentage of the seed was (41.88 %) but after the storage 18 months (540 days) in tin container, aluminium foil, polythene bag, cloth bag it was declined. Seeds stored in Tin showed significantly higher protein content percentage (36.43 %) as compared to those stored in Aluminium foil (32.52 %), Polythene bag (30.64 %) and Cloth bag (27.62 %) up to 540 days (T7) days of the storage. Among the containers Tin showed significantly higher mean of protein content percentage (38.58 %) as compared to Aluminium foil (36.32 %), Polythene bag (35.06 %) and Cloth bag (33.51 %) throughout the storage period. Similar findings were reported by Ying et al. (2022) in peanuts plants. So, the present study was revealed that tin container better storage for storing seeds as compared to aluminium foil, polythene bag and cloth bag.

Storage Period	Different Containers			
	Tin container	Aluminium foil	Polythene bag	Cloth bag
T1	40.76	40.76	40.76	40.76
T2	38.62	37.63	36.72	36.58
T3	36.36	35.74	34.65	33.39
T4	36.23	34.72	32.52	30.48
T5	37.75	33.56	32.32	29.23
T6	36.43	32.36	31.45	28.75
T7	35.23	33.66	31.12	28.25
Mean	37.34	35.49	34.22	32.49
SE (m)	1.055	0.684	0.648	0.599
CD (P=5%)	3.201	2.076	1.967	1.818

Table 1. Oil Content (%) of mustard seeds stored in different containers.

Table 2. Protein Content (%) of mustard seeds stored in different containers.

Storage Period	Different Containers			
	Tin container	Aluminium foil	Polythene bag	Cloth bag
T1	41.88	41.88	41.88	41.88
T2	39.52	38.55	37.81	37.68
T3	38.82	36.77	36.65	34.67
T4	37.76	35.87	34.82	33.76
T5	37.88	34.76	32.74	30.51
T6	37.75	33.91	30.88	28.46
T7	36.43	32.52	30.64	27.62
Mean	38.58	36.32	35.06	33.51
SE (m)	1.095	0.841	0.744	0.674
CD (P=5%)	3.323	2.551	2.258	2.044

CONCLUSION

The present study was concluded that the oil content and protein content were better significant in seeds stored in

air tight tin container as compared to aluminium foil, polythene bag and cloth bag. Storage condition affects the production of normal germination, dead seedlings, oil content, protein content and the study revealed that seed storage in tin container was better storage container than aluminium foil, polythene bag, cloth bag for mustard seed.

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CONFLICT OF INTEREST

There are no conflict of interest.

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