Sesamum Indicum L. Seed Treatment to Maintain Vigor, Viability, and Yield Potential

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Abstract:

Testing seeds ensures that only those with the potential to produce the desired crop are planted. The germination rate of a seed is a good indicator of how successful the seed will be in producing a plant. Germination testing is often performed to determine the viability of sesame seeds. The purpose of germination testing is to identify the viability of seeds to germinate under ideal conditions. The goal of this study is to find ways to treat Sesamum Indicum L. seeds so that they retain their vitality, viability, and yield potential.

Keywords: Sesamum Indicum L., Seed Treatment, Seed Germination

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Introduction:

Sesamum indicum L. (sesame) benefits greatly from seed treatment in order to preserve seed vigour and viability and to maximize yield potential. Here are some guidelines and things to keep in mind while treating sesame seeds (1):

Priming is hydrating seeds in a regulated manner to start the germination process without allowing full germination to occur. Sesame seed vigour, consistent germination, and early seedling development may all be improved by priming treatments including hydropriming (soaking seeds in water), osmopriming (soaking seeds in osmotic solutions), and biopriming (using beneficial microbes) (2).

Protecting sesame seeds from diseases, pests, and environmental stresses by coating them in different compounds is called seed coating. Seeds may be made healthier and more vigorous by applying a covering of fungicides, insecticides, biocontrol agents, or nutrients prior to planting (3).

The use of helpful microorganisms as a seed treatment may improve crop vigour and provide protection against diseases. Bio-priming improves sesame's nutritional availability, disease resistance, and general plant development by introducing beneficial microorganisms into the seed at the time of planting (4).

Seed treatments with critical nutrients may increase early nutrient availability, stimulate strong seedling development, and boost plant yield as a whole. Coating seeds with micronutrient or macronutrient formulations is a common method of providing nutrients during early development when they may be lacking (5).

Controlling Pests and Illness Sesame seed-borne illnesses and pests may be controlled with the use of seed treatments. Seed treatments with fungicides and insecticides may reduce the risk of illness and damage to seedlings caused by seed-borne pathogens and insect pests, respectively (6-8)

Choosing High-Quality Seeds: Depending on high-quality seeds maintaining vitality, viability, production and potential of sesame's. Seeds should be disease-free, genetically pure, and have a high germination rate, so be sure to get them from a reputable supplier (9, 10).

It's worth noting that different regions, varieties of sesame, and levels of pest and disease burden will call for different approaches to seed treatment. More precise advice on how to handle your sesame seeds might be available if you consulted a local agricultural specialist, extension office, or research journal on the topic of sesame production in your area (11).

Please bear in mind that although these methods may help preserve sesame's vitality, viability, and production potential, their efficacy may vary based on contextual elements and environmental circumstances. In order to determine which kind of seed treatment is most effective for growing sesame, it is necessary to conduct field experiments and keep track of the outcomes (11).

Materials and methods

In this experiment, we utilised freshly harvested seeds of the sesame (Sesamum indicum L.) varieties "Rama" and "B-67" from the Calcutta University Agricultural Experimental Farm in Baruipur, 24 Parganas (South), West Bengal. In a drying cabinet at 35 1°C for four days, we reduced the moisture content of the seeds to around 8.9% before storing them in the rubber-capped glass bottles (2.5 litres) at room temperature. At initially, all of the seeds were split into three batches: one for pre-storage, one for intermediate storage, and one for post-storage. After a month had passed since their harvest, the seeds were given invigoration treatments before being kept in glass bottles with rubber stoppers with a size of 100 millilitres. Seeds that had been stored for 5 months were given a mid-storage treatment and seeds that had been stored for 9 months were given a post-storage (presowing) treatment.

Pattern Determination of decline in vigour and viability in different containers under ambient condition of sesamum (cv. Rama and B-67) seeds stored

Five hundred grammes of sesamum seeds were harvested, then divided among six different containers (a paper packet, a cloth bag, a gunny bag, a polythene packet, a metal tin, and a glass

bottle) and kept at room temperature in a laboratory in Kolkata until analysis could be completed. Each container's worth of seeds was sampled once a month for germination analysis. More than 400 seedlings from each treatment were planted in soil according to ISTA (1996) recommendations. The proportion of seeds that germinated and the height of the resultant seedlings were measured after 5 days of incubation at 20 1°C.

Pre-storage seed invigoration treatments effect for the maintenance of storability of sesamum

Pre-storage seed invigoration treatments were given to 1-month-old sesamum seeds employing dry and wet treatments.

Mid-storage dry and wet seed invigoration treatments efficacy for the maintenance of storability of sesamum seed

Sesamum (cv. Rama and B-67) seed was five months old and was subjected to both dry and moist treatments in the middle of storage. All other aspects of the prior trial, including the dry and wet seed treatments, dosages of chemicals, medicinal goods, and crude plant material, remained unchanged. The germination test and ageing process were also discussed at length before. The treatment regimens were the same as those used for the invigoration of seeds before storage.

Statistical Analysis

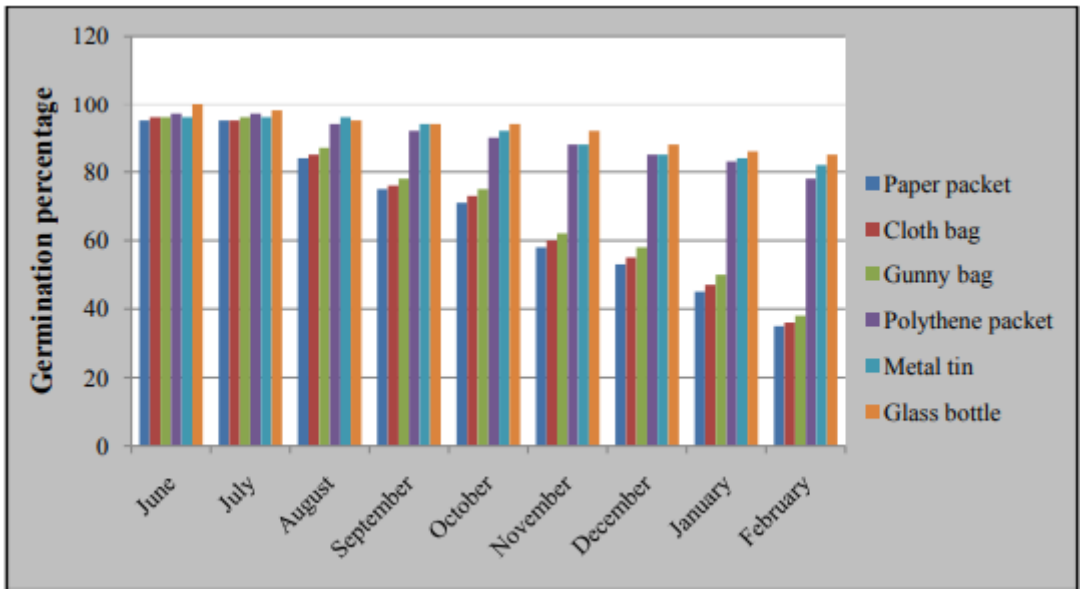
The effects of the treatments on germinability, field performance, and productivity were assessed using statistical analysis using the analysis of variance (Fisher, 1948) applied to data collected from germination tests, field experiments, and biochemical analyses. Root and shoot length data were analysed after being translated from radians to degrees (Arc-sin value) to match germination percentage data. The vigour index was determined by multiplying the germination rate by the seedling height.

Result:

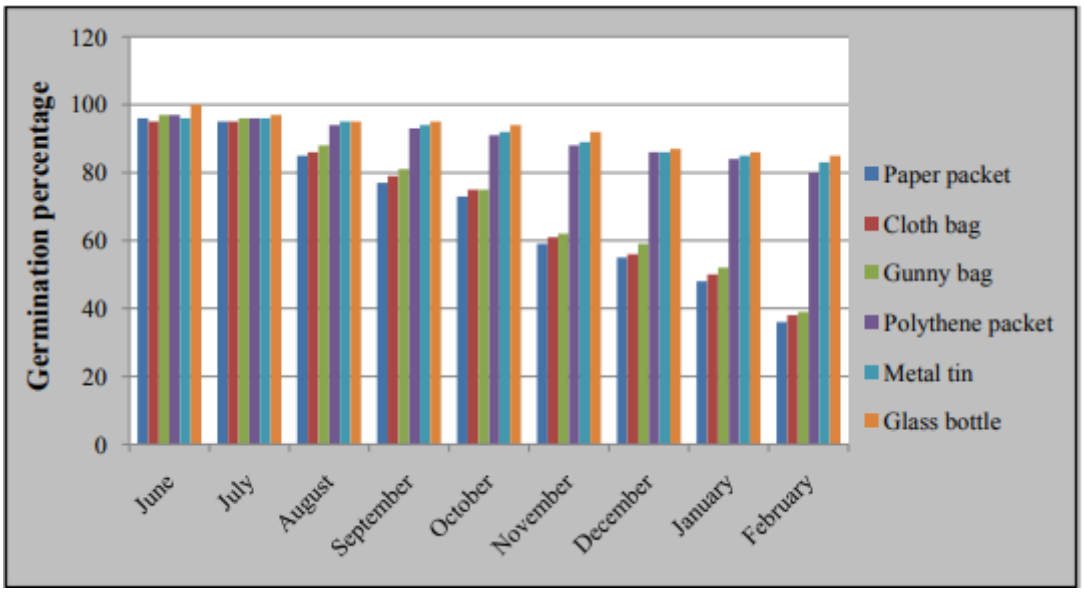
Pattern determination of decline in vigour and viability in different containers under ambient condition of sesamum (cv. Rama and B-67) seeds stored

Seeds of Sesamum (cv. Rama and B67) were germinated and measured for length as they grew from June through February in a variety of storage containers. With the commencement of pre-monsoon and monsoon rains in May/June, relative humidity began to increase, leading to a drop in germination percentage and vigour as assessed by root and branch length of the seedling. During the monsoon months (July-August), seeds stored in cloth bag, gunny bag, and paper packet absorb a lot of moisture from the humid environment, leading to fast seed degradation at the time of next planting. Seeds fare better in a moisture-proof container like a polythene bag, metal can, or glass bottle than they would in a fabric bag. Seeds housed in paper packets had a

germination rate of 35% by the end of February, whereas those kept in metal tins and glass bottles (moisture barrier containers) had germination rates of 80% or higher (Figure 1 and 2).

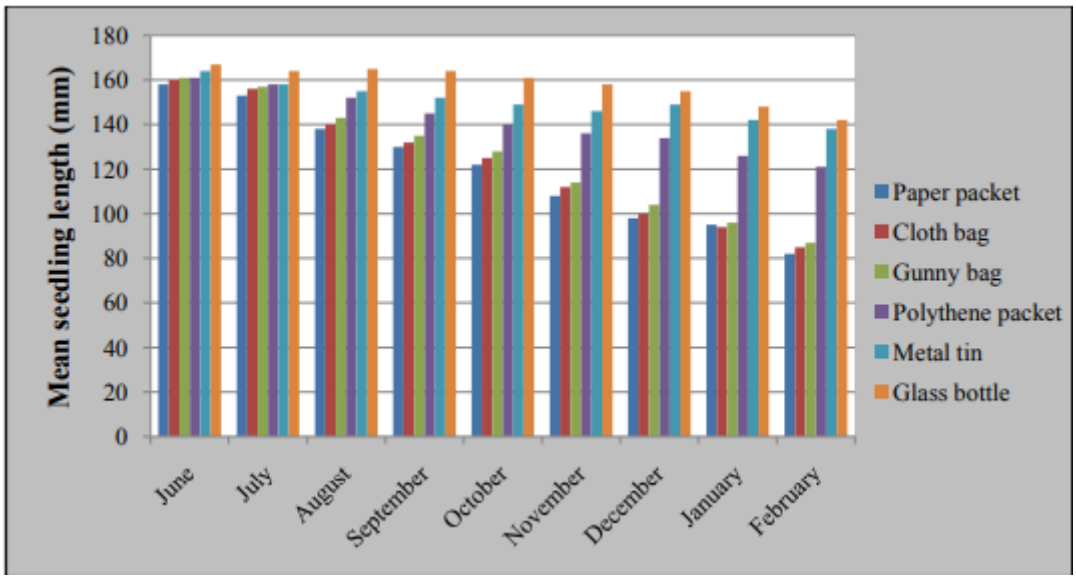


(a) cv. Rama

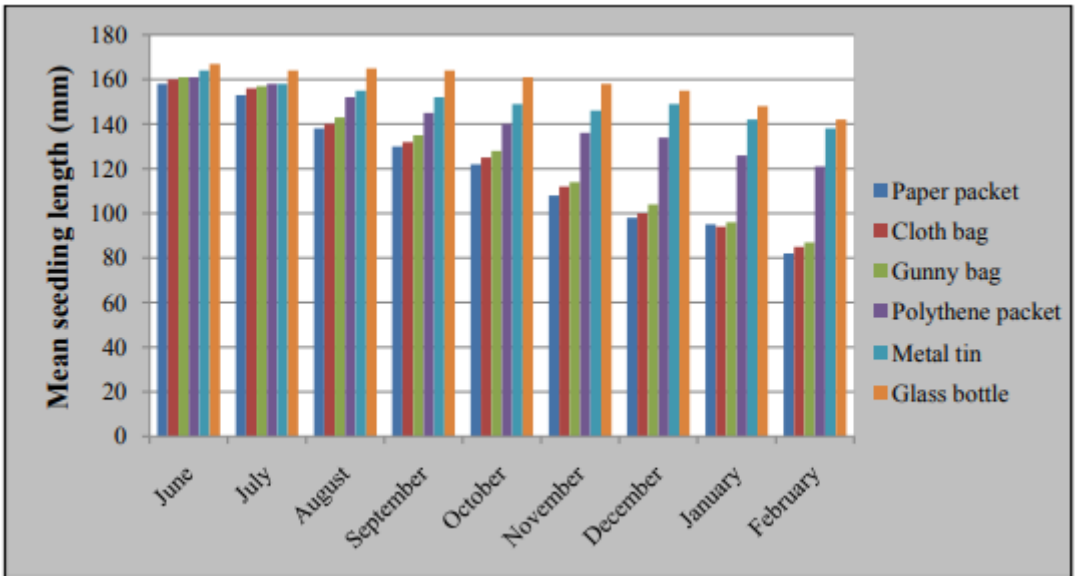


(b) cv. B-67

Figure 1: Decline Pattern on viability (germination percentage) in different containers under ambient conditions of sesamum (cv. Rama and cv. B-67) seeds stored



(a) cv. Rama



(b) cv. B-67

Figure 2: Pattern of decline on vigour (mean seedling length) of sesamum (cv. Rama and cv. B-67) seeds stored in different containers under ambient conditions

Maintenance of storability Effect of pre-storage seed invigoration treatments of sesamum

Germination test conducted immediately after pre-storage dry and wet treatments (before ageing), treated seeds of sesamum (cv. Rama and B-67) did not show any beneficial effects on germinability over untreated control (Table 1 and 2). Few dry treatments showed a marginal improvement on seedling vigour over control.

Table 1: Effect of pre-storage seed invigoration treatments on vigour and viability of stored sesamum (cv. Rama) seed immediately after treatment i.e., before ageing conditions

PhysiologicalTreatments	Germination		Mean root length (mm)	Mean shoot length (mm)	Vigour index
	%	Arc-sin value			
Control	95	77.0	101	52	14535
Bleaching powder	97	80.0	102	55	15229
Para-amino-benzoic acid	95	77.0	101	53	14630
Aspirin	98	81.8	103	56	15582
Ascorbic acid	97	80.0	102	53	15035
Red chilli powder	97	80.0	100	52	14744
Lemon leaf powder	95	77.0	102	52	14630
Spinach leaf powder	94	75.8	103	53	14664
Soaking-drying (W)	94	75.8	103	52	14570
L. S. D. (P = 0.05)	-	NS	NS	NS	-
L. S. D. (P = 0.01)	-	NS	NS	NS	-

Table 2: Effect of pre-storage seed invigoration treatments on vigour and viability of stored sesamum (cv. B-67) seed immediately after treatment i.e., before ageing conditions

PhysiologicalTreatments	Germination		Mean root length (mm)	Mean shoot length (mm)	Vigourindex
	%	Arc-sin value			
Control	95	77.0	107	58	15675
Bleaching powder	97	80.0	108	61	16339
Para-amino-benzoic acid	96	78.4	107	58	15840
Aspirin	98	81.8	108	60	16464

Ascorbic acid	96	78.4	106	59	15840
Red chilli powder	96	78.4	107	57	15744
Lemon leaf powder	95	77.0	106	58	15580
Spinach leaf powder	95	77.0	106	58	15580
Soaking-drying (W)	94	75.8	107	57	15416
L. S. D. (P = 0.05)	-	NS	NS	NS	-
L. S. D. (P = 0.01)	-	NS	NS	NS	-

Mid-storage dry and wet seed invigoration treatments Efficacy for the maintenance of storability of sesamum seed

Mid-storage treated seeds of cv. Rama and B-67 did not significantly outperform their untreated controls in a germination test performed immediately after treatment (Tables 3 and 4).

Table 3: Mid-storage seed invigoration treatments effect on vigour and viability of stored sesamum (cv. Rama) seed immediately after treatment i.e., before ageing conditions

PhysiologicalTreatments	Germination		Mean root length (mm)	Mean shoot length (mm)	Vigourindex
	%	Arc-sin value			
Control	88	69.7	94	49	12584
Bleaching powder	92	73.5	95	51	13432
Para-amino-benzoic acid	91	72.5	93	50	13013
Aspirin	92	73.5	96	52	13616
Ascorbic acid	90	71.5	95	49	12960
Red chilli powder	90	71.5	95	51	13140
Lemon leaf powder	91	72.5	94	50	13104
Spinach leaf powder	90	71.5	93	50	12870
Soaking-drying (W)	90	71.5	94	50	12960
L. S. D. (P = 0.05)	-	NS	NS	NS	-

L. S. D. (P = 0.01)	-	NS	NS	NS	-

Table 4: Effect of mid-storage seed invigoration treatments on vigour and viability of stored sesamum (cv. B-67) seed immediately after treatment i.e., before ageing conditions

Physiological Treatments	Germination		Mean root length (mm)	Mean shoot length (mm)	Vigourindex
	%	Arc-sin value			
Control	87	68.8	90	54	12528
Bleaching powder	90	71.5	93	56	13410
Para-amino-benzoic acid	89	70.6	92	57	13261
Aspirin	90	71.5	94	55	13410
Ascorbic acid	89	70.6	92	56	13172
Red chilli powder	89	70.6	92	56	13172
Lemon leaf powder	88	69.7	92	55	12936
Spinach leaf powder	88	69.7	91	55	12848
Soaking-drying (W)	88	69.7	91	56	12936
L. S. D. (P = 0.05)	-	NS	NS	NS	-
L. S. D. (P = 0.01)	-	NS	NS	NS	-

Effect of post-storage (pre-sowing) seed invigoration treatments for the maintenance of storability of sesamum

Eight-month-old sesamum seeds (before planting in the field) were given seed invigoration treatments in both cultivars (cv. Rama and B-67). There was no discernible change in the vigour and viability of treated and untreated seeds in germination tests performed immediately after pre-sowing (post-storage) treatment (Tables 5 and 6). Root and shoot length measurements indicated just a little increase in vigour after soaking followed by mild air drying.

Table 5: Effect of post-storage seed invigoration treatments on the germinability of sesamum (cv. Rama) seed tested prior to sowing in the field

Physiological Treatments	Germination		Mean root length (mm)	Mean shoot length (mm)	Vigour index
	%	Arc-sin Value			
Control	71	57.4	60	49	
Bleaching powder	77	61.3	61	50	
Para-amino-benzoic acid	77	61.3	60	49	
Aspirin	78	62.0	63	52	
Ascorbic acid	76	60.6	61	50	
Red chilli powder	78	62.0	62	51	
Lemon leaf powder	76	60.6	61	50	
Spinach leaf powder	76	60.6	62	51	
Soaking-drying (W)	74	59.3	60	50	
L. S. D. (P = 0.05)	-	NS	NS	NS	-
L. S. D. (P = 0.01)	-	NS	NS	NS	-

Table 6: Effect of post-storage seed invigoration treatments on the germinability of sesamum (cv. B-67) seed tested prior to sowing in the field

Physiological Treatments	Germination		Mean root length (mm)	Mean shoot length (mm)	Vigour index
	%	Arc-sin value			
Control	72	58.0	61	50	
Bleaching powder	78	62.0	62	51	
Para-amino-benzoic acid	78	62.0	61	50	
Aspirin	79	62.7	64	53	

Ascorbic acid	77	61.3	62	51	
Red chilli powder	78	62.0	63	52	
Lemon leaf powder	77	61.3	62	51	
Spinach leaf powder	77	61.3	63	52	
Soaking-drying (W)	74	59.3	61	51	
L. S. D. (P = 0.05)	-	NS	NS	NS	-
L. S. D. (P = 0.01)	-	NS	NS	NS	-

Pre-storage, mid-storage and post-storage dry and wet seed treatments efficacy for improved field performance and productivity of stored sesamum

Tables 7 and 8 compare the results of raising a crop from pre-storage dry treated and untreated seeds of sesamum (cv. Rama and B-67), and show that the pre-storage dry treated seeds significantly outperformed the untreated control in terms of seed yield per unit area, plant height, number of capsules per plant, number of seeds per capsule, and 1000-seed weight. However, the pre-storage wet (soaking-drying) treatment was not as successful as the pre-storage dry treatments in boosting field performance and production.

Table 7: Effect of pre-storage seed invigoration treatments on field performance and productivity of sesamum (cv. Rama)

Physiological Treatments	Field emergence (%)	Height/plant (cm)	Number of branches/ plant	Number of capsule/ plant	Total capsule weight/ plant(g)	Number of seeds/ capsule	Seed yield/m^2 (g)	1000-seed weight (g)
Control	73	65.3	3	26	4.4	55	19.8	2.75
Bleaching powder	86	62.2	3	33	6.8	60	26.7	3.56
Para-amino-benzoic acid	79	55.3	2	32	6.6	62	28.4	3.40
Aspirin	82	67.4	3	34	6.9	59	29.3	3.60
Ascorbic acid	82	63.5	2	31	6.2	61	22.5	3.12

Red chilli powder	78	70.3	3	29	5.5	57	28.4	3.40
Lemon leaf powder	72	73.2	3	32	6.7	60	25.7	2.85
Spinach leaf powder	70	68.7	2	30	5.9	56	23.5	3.10
Soaking-drying (W)	74	72.6	2	29	5.2	63	23.8	2.92
L. S. D. (P = 0.05)	2.1	0.9	NS	2.3	1.0	1.1	3.8	0.16
L. S. D. (P = 0.01)	3.1	1.4	NS	3.4	1.3	2.2	5.5	0.21

Table 8: Pre-storage seed invigoration treatments effect on field performance and productivity of sesamum (cv. B-67)

Physiological Treatments	Field Emergence (%)	Height/plant (cm)	Number of branches/ plant	Number of capsule/ plant	Total capsule weight/ plant(g)	Number of seeds/ capsule	Seed yield/m^2 (g)	1000-seed weight (g)
Control	75	58.3	3	26	4.4	42	21.1	2.56
Bleaching powder	94	74.5	3	40	6.8	60	33.7	4.07
Para-amino-benzoic acid	80	70.9	2	34	6.6	48	26.3	2.92
Aspirin	96	75.2	3	42	6.9	64	35.9	4.25
Ascorbic acid	86	69.5	2	35	6.2	52	28.5	3.00
Red chilli powder	79	61.2	3	27	5.5	44	23.4	2.78
Lemon leaf powder	88	68.3	3	32	6.7	54	29.0	3.65

Spinach leaf powder	82	65.7	2	30	5.9	50	28.0	3.37
Soaking-drying (W)	92	73.8	2	38	5.2	57	31.2	3.92
L. S. D. (P = 0.05)	3.2	2.0	NS	2.6	0.7	3.9	3.1	0.59
L. S. D. (P = 0.01)	4.3	2.7	NS	3.6	0.9	5.4	4.2	0.83

Conclusion:

Sesame seeds are often known as oil seeds. Despite the fact that its storage physiology has not been recorded in Nigeria, sesame's handling and storage remain a challenge despite the growing demand for the crop.

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