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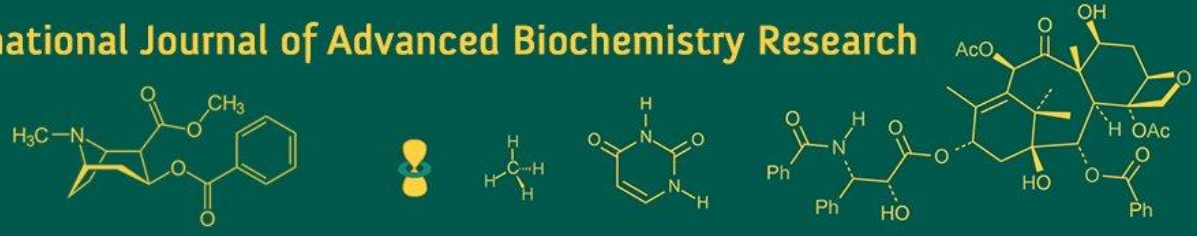

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Effect of various seed pelleting formulations on seed quality under salinity stress on storability of tomato (*Lycopersicum esculentum* L.) Var. PKM-1

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Abstract
The present experiment was conducted at Department of Seed Science and Technology, MIT College of Agriculture and Technology, Vellalapatti, Musiri, Trichy, Tamil Nadu, India. During 2024-2025 with tomato seeds (PKM-1). The seeds were pelleted with organic and inorganic formulations along with botanical powder and also maintained untreated seeds as control. Treatment details *viz*., where T_1 - control, T_2 -Positive control, T_3- GA_3 @(1,2gm), T_4- neem leaf powder+ turmeric powder + nano urea (5, 10ml), T_5- neem leaf powder+ turmeric powder + Sea Secret (5, 10ml), T_6 - Neem leaf powder + turmeric powder+ Humic Secret (5, 10ml), T_7 - neem leaf powder+ turmeric powder + *Azsopirillum* (5, 10gm), T_8 -neem leaf powder+ turmeric powder + *Trichoderma viridae* (5, 10 gm), T_9 - neem leaf powder+ turmeric powder + *Pseudomonas* (5, 10gm), T_{10} - neem leaf powder+ turmeric powder + *Phosphobacteria* (5, 10gm). Data was subjected to facrtorial experiment laid out in completely randomized design. The seeds were assessed of quality attributes, was done in terms of germination per cent, seedling length, seedling dry weight, seedling vigour index-I and seedling vigour index-II. Whereas, germination per cent, seedling length, seedling weight, seedling vigour index showed maximum in treatment combination T_3-GA_3 1gm was closely followed by T_5- neem leaf powder+turmeric powder+Sea Secret (5ml) when compared to other treatments. However, electrical conductivity and were lowest in T_3 - GA_3 (1gm).

Keywords: Tomato PKM-1, GA_3, neem leaf powder, turmeric powder, pelleting

Introduction
Seed is a basic input of agriculture. Inferior quality seed give poor performance and yield potential is too low and it production cost occurred very high. All of these make seed production cost high. So, it is necessary to improve the quality of seed by using seed enhancement techniques. Seed pelleting is one of the most successful process to increase the seed quality attributes. It is the process of enclosing a seed with small quantity of inert material just large enough to produce globular unit of standard size to provide small amount of nutrients to young seedlings. Pelleting is defined as the deposition of a layer of inert materials that may obscure the original shape and size of the seed, resulting in a substantial weight increase and improved plannability. The coating should result in a more or less continuous pelleting, which eliminates or minimizes product dust-off. The most essential phase of precision planting is the singling of seeds for exact placement at a pre-determined depth and spacing in the soil with a uniform coverage and at a reasonable planting speed. Singling is difficult for seeds which are low in density and irregular in shape. These difficulties could be overcome by using seed pelleting process.

Tomato (*Lycopersicon esculentum*) 2n=24 a self-pollinated crop is one of the important solanaceous vegetable crops grown widely all over the world because of its special nutritive value and also its wide spread production. It is the world's largest vegetable crops. Tomato ranks third in priority on consumption basis after Potato and Onion in India but ranks second after potato in the world. India ranks second in the area as well as in production of Tomato. The major tomato growing countries are China, USA, Italy, Turkey, India and Egypt. In India major tomato producing states are Andhra Pradesh, Karnataka, Telangana, Odisha, and Gujarat. Tomato is one of the important vegetable crops being cultivated throughout India.

Seed pelleting is the process of enclosing a seed with small quantity of inert material just large enough to produce globular unit of standard size to provide small amount of nutrients to young seedlings (Roos, 1979; Scott, 1989 and Krishnasamy, 2003) [13, 14, 10]. The application of pelleted to seed serves as an extra exterior shell in order to give the desired seed characteristics *viz*., quick or delayed water uptake and enhanced germination that would be beneficial for better emergence and establishment in the given condition. Therefore the present study was undertaken to know the effect of treatment on seed quality characters.

Materials and Methods

The experiment was conducted with cleaned, graded and pelleted seeds of tomato cv. PKM 1 as per the following treatments. The study was Carried out at the Department of Seed Science and Technology, MIT College of Agriculture and Technology, Musiri, Trichy, Tamil Nadu, India in Complete Randomized Design (CRD) during year 2024-2025.

Variety- PKM -1

Treatment details

Containers

C1 - Cloth bag

C2 - Aluminium foil pouch

A) Adhesive: Carboxy Methyl Cellulose (2%)

B) Filler Material: Neem leaf powder (100gm+ Turmeric power 50gm)

T_1-Control

T_2 - Positive Control Neem leaf powder (100g kg $^{-1}$) + Turmeric powder (50g kg^{-1})

T_3- Neem leaf powder (100g kg $^{-1}$) + Turmeric powder (50g kg^{-1}) +GA_3 1gm kg $^{-1}$)

T_4 - Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) + GA_3 2gm kg $^{-1}$)

T_5- Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) + Nano Urea (5 ml kg^{-1})

T_6- Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) +Nano Urea (10 ml kg^{-1})

T_7- Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) +Sea Secret (5 ml kg^{-1})

T_8 - Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) +Sea Secret (10 ml kg^{-1})

T_9- Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) +Humic Secret (5ml kg^{-1})

T_{10} - Neem leaf powder (100g kg^{-1}) +Turmeric powder (50g kg^{-1}) +Humic Secret (10ml kg^{-1})

T_{11}- Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) +Azsopirillum (5 g kg^{-1})

T_{12} - Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) + Azsopirillum (10 g kg^{-1})

T_{13}- Neem leaf powder (100g kg^{-1}) +Turmeric powder (50g kg^{-1}) +Trichoderma viridae (5 g kg^{-1})

T_{14} - Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) +Trichoderma viridae (10 g kg^{-1})

T_{15}- Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) + Pseudomonas (5 g kg^{-1})

T_{16} - Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) +Pseudomonas (10 g kg^{-1})

T_{17}- Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) +Phosphobacteria (5 g kg^{-1})

T_{18} -Neem leaf powder (100g kg^{-1}) +Turmeric powder (50g kg^{-1}) + Phosphobacteria (10g kg^{-1})

Observations

Germination percentage

It refers to the proportion by number of seeds which have produced seedlings classified as normal under the conditions and within the period specified that is the percentage of normal seedlings**.** (ISTA, 2017) [8] The equation to calculate germination percent is:

$$GP\ (\%) = \frac{\text{No. of seeds germinated}}{\text{Total no. of seeds}} \text{ X } 100$$

Root length (cm)

From the germination test, ten normal seedlings were selected randomly in each treatment from all the replication on 8th day. The root length was measured from the tip of the primary root to base of hypocotyls and mean root length was expressed in centimetres.

Shoot Length (cm)

Ten normal seedlings used for root length measurement were also used for the measurement of shoot length. The shoot length was measured from the base of the primary leaf to the base of the hypocotyls and mean shoot length was expressed in centimetres.

Seedling length (cm)

Seedling length is the best indicator of seed vigour. The relative length of root and shoot of seedlings would predict their subsequent growth and performance.

Dry matter (g)

Dry weights were based on weights determined before and after oven drying of seedling samples at 103^{0}C for 4hours.

Vigour indices

The computed vigour index, which is the totality of performance, has been regarded as a good index to measure the quality of seed lots (Abdul-Baki and Anderson, 1973) [1].

Vigour index I

Germination (%) x Mean seedling length (cm).

Vigour index II

Germination (%) x Mean seedling dry weight (cm).

Electrical conductivity (dSm^{-1})

Twenty-five seeds were taken randomly from each treatment in four replicates and they were surface sterilized to remove chemical residues, if any. Then they were soaked in 100 ml distilled water for 17 hours at a temperature of 25+/-1^{0}C. After incubation the conductivity of seed leachate was measured in a digital conductivity meter (model-HSN code-90278090) and the EC was expressed in dSm-1 (AOSA 1983) [2].

Results and Discussion

Significant results were obtained due to seed pelleting with Neem leaf powder+ Turmeric powder for the seed quality parameters. Results were significantly recorded higher in seeds pelleted with Neem leaf powder+ Turmeric powder T_3 - GA3 -1gm seed followed by T_9- neem leaf powder+

Turmeric powder with Humic secret 5ml compared to all other treatments and the lowest germination percent, shoot length, root length, Seedling length, seedling dry weight, vigour index I and II recorded in T_1 (control). Similar results were also reported by Geetharani *et al*, 2006 [7], Kamara *et al*. (2014) [9]. At the lowest electrical conductivity was recorded in the seeds pelleted with T_3- Neem leaf powder+ Turmeric powder + GA3 -1gm followed by T_9- Neem leaf powder+ Turmeric powder with Humic secret 5ml.

Germination present in T_3- Neem leaf powder+ Turmeric powder with GA3 -1gm (75.67%) recorded higher germination. followed by T_9- Neem leaf powder+ Turmeric powder with Humic secret 5ml. (67.33%) lower in T_1 (21.33) because of lower respiration rate and metabolic activity and inactivation of enzymes required for retention of germination for longer period Dhatt *et al*., 2009 [4] it is evidenced by higher germination at end of the research. Higher Shoot length (8.99), root length (7.67), Seedling length (16.31), seedling dry weight (23.74) was obtained in T_3- Neem leaf powder+ Turmeric powder T_3 - GA3 -1gm. Followed by T_9- Neem leaf powder+ Turmeric powder with Humic secret 5ml. (8.48), (7.55), (15.63), (22.53) and lower in T_1 Control (6.23), (5.99), (12.08), (14.01) respectively.

It was due to higher percentage and better germination of seedlings in seeds pelleted with neem leaf powder + turmeric powder this protects fungi invasion thereby good and better germination and subsequent higher root and shoots lengths, seedling dry weight Basavaraj *et al*. (2008) [3] in onion, higher seedling length and seedling dry weight is an indication of maintenance of vigour in the seeds preserved in ambient storage.

Higher seed vigour index I (1238), II (1796) was obtained T_3- Neem leaf powder+ Turmeric powder T_3 - GA3 -1 gm. followed by T_9- Neem leaf powder+ Turmeric powder with Humic secret 5ml. (1469), (3479), and lower in T_0P1 (1057), (1521), respectively in pelleting along with fungicide and insecticide it is due to more germination, root and shoot length, seedling dry weight, lesser infection by storage fungi.

The lower electrical conductivity (145.0) was obtained in T_3- Neem leaf powder+ Turmeric powder T_3 - GA3 -1gm. Followed by T_17- Neem leaf powder+ Turmeric powder+ phosphobacteria (5ml) (155.0) higher in T_0P1 (171.8) this was mainly governed by lower cell wall permeability which indicated lower respiration rate and metabolic activity maintenance of vigour. This finding in supported by Doijode 2000 [6] in winter squash and kumar *et al*. 2011 [11] in karanj seeds.

Table 1: Effect of various seed pelleting on the germination and seedling length of Tomato cv. PKM 1

Treatments	Germination (%)	Shoot Length (cm)	Root Length (cm)	Seedling Length (cm)
T_1	21.33 (27.48)	6.23	5.99	12.08
T_2	54.33 (47.46)	7.99	6.83	14.34
T_3	75.67 (60.66)	8.99	7.67	16.31
T_4	60.33 (50.94)	6.62	5.88	12.78
T_5	66.00 (54.31)	8.11	7.34	15.44
T_6	44.33 (41.71)	7.30	6.85	14.26
T_7	52.33 (46.32)	7.98	6.43	14.65
T_8	40.67 (39.60)	8.22	7.10	14.97
T_9	67.33 (55.23)	8.48	7.55	15.63
T_{10}	34.00 (35.63)	7.15	6.43	13.26
T_{11}	48.00 (43.83)	7.82	6.98	14.41
T_{12}	51.00 (45.55)	7.90	6.51	14.29
T_{13}	63.33 (52.71)	7.34	6.99	13.39
T_{14}	54.67 (47.68)	7.96	7.59	14.64
T_{15}	54.00 (47.29)	7.09	5.67	12.99
T_{16}	44.33 (41.72)	7.60	5.71	13.01
T_{17}	50.00 (44.97)	7.30	6.69	14.16
T_{18}	52.67 (46.51)	7.94	6.63	14.27
Mean	51.91	7.66	6.71	14.16
SEm+	2.87	0.34	0.35	0.56
CD(p:0.05)	8.25	1.00	1.01	1.63
CV%	9.60	7.87	9.16	6.96

T_1-Control

T_2 - Positive Control Neem leaf powder (100g kg $^{-1}$) + Turmeric powder (50g kg^{-1})

T_3- Neem leaf powder (100g kg $^{-1}$) + Turmeric powder (50g kg^{-1}) +GA_3 (1gm kg $^{-1}$)

T_4 - Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) + GA_3 (2gm kg $^{-1}$)

T_5- Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) + Nano Urea (5 ml kg^{-1})

T_6- Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) +Nano Urea (10 ml kg^{-1})

T_7- Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) +Sea Secret (5 ml kg^{-1})

T_8 - Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) +Sea Secret (10 ml kg^{-1})

T_9- Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) +Humic Secret (5ml kg^{-1}))

T_{10} - Neem leaf powder (100g kg^{-1}) +Turmeric powder (50g kg^{-1}) +Humic Secret (10ml kg^{-1})

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T_{18} -Neem leaf powder (100g kg^{-1}) +Turmeric powder (50g kg^{-1}) + Phosphobacteria (10g kg^{-1})

Table 2: Effect of various seed pelleting on the Vigour Index and Electrical Conductivity of Tomato cv. PKM 1

Treatments	Dry Weight (mg)	Vigour Index-I	Vigour Index -II	Electrical Conductivity
T_1	14.01	257	257	162.7
T_2	17.87	781	781	162.0
T_3	23.74	1238	1238	145.0
T_4	15.92	769	769	146.0
T_5	22.21	1019	1019	161.4
T_6	18.43	629	629	168.6
T_7	18.64	766	766	171.8
T_8	21.60	608	608	169.7
T_9	22.53	1057	1057	162.0
T_{10}	18.59	449	449	158.3
T_{11}	17.78	690	690	163.1
T_{12}	15.90	727	727	160.7
T_{13}	16.71	846	846	163.0
T_{14}	18.73	799	799	160.5
T_{15}	16.22	699	699	160.2
T16	20.58	577	577	162.6
T17	19.73	708	708	155.0
T18	18.06	751	751	163.1
Mean	18.73	742.82	987.73	160.9
SEm+	1.18	50.18	75.02	0.77
CD(p:0.05)	3.40	143.99	215.17	2.22
CV%	10.97	11.70	13.15	0.83

Fig 1: Seed pelleting material of through various treatments on tomato seeds.

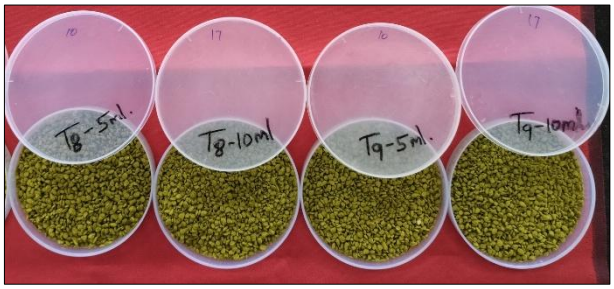

Fig 2: Seed pelleting material of through various treatments on tomato seeds.

T_8 - Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) +Sea Secret (10 ml kg^{-1})
T_9- Neem leaf powder (100g kg^{-1}) + Turmeric powder (50g kg^{-1}) +Humic Secret (5ml kg^{-1})

Conclusion

It is concluded that from the present investigation that tomato seeds pelletized and treated with the combined treatment of neem leaf powder and turmeric powder and insecticide obtained T_3- Neem leaf powder+ Turmeric powder with GA3 -1gm followed by T_9- Neem leaf powder+ Turmeric powder with Humic secret 5 ml. Recorded significantly higher seed quality parameters. These two seed treatments were found effective in improving the shelf life of seed and it is more beneficial to the farmers. Tomato seeds packed in aluminium foil pouches found more effective for extended seed longevity and to maintain the storability by safe guarding seeds from deteriorating.

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