



Enhancing the Vigour and Viability through Grape Extract (Juice and Seed) in Aged Seeds of Paddy, Sorghum, Black Gram and Green Gram

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Abstract

Indian farmers have the habit of saving the seeds for sowing in the next season especially the seeds of paddy, sorghum and pulses. Such seeds that are reserved tend to lose their vigour and viability leading to ultimate decrease in the yield. To overcome this kind of obstacles to farmers a simple seed treatment using anti-oxidant substance could be used. In the present study the grape juice and grape seed extracts rich in antioxidants at different concentrations were used to treat the aged seeds of paddy, sorghum, black gram and green gram. The treated seeds were germinated by roll towel method to estimate various germination traits. The variability of different treatments was calculated in Completely Randomised Design (CRD). In all the crop seeds under study the seed treatment with 10% grape seed extract showed maximum recovery of seed germination percentage, seed vigour and speed of germination. This technique of seed treatment could be practised easily by the farmers as home remedy to improve the quality of their reserved seeds.

Keywords: Reserved Seeds; Viability; Antioxidants; Seed Treatment; CRD; Seed Extract

Introduction

India is country where we practice a full course meal system especially recipes rich in cereals and pulses as they are the sources of carbohydrates and proteins in our diet. Both cereals and pulses are inevitable crops of agriculture in our country. Rice (*Oryza sativa* L.) is the principal food of nearly half the world's population. The demand for rice is expected to increase further in view of expected increase in the population. Sorghum (*Sorghum bicolor* L.) is a basic staple food for many rural communities and is gaining momentum due to its nutritional value. Sorghum is mainly a saviour crop for farmers farming in drier areas, especially on shallow and heavy clay soils. Pulses are the most important legume crop in India because of their high-quality protein. Black gram (*Vigna mungo* L.) is one of most important pulses in India. It contributes a major share

of protein requirement to the population in India. Green gram (*Vigna radiata*) is another excellent source of high-quality protein (25%) having high digestibility. It is consumed as whole grains as well as "Dal" in a variety of ways in our food.

When it comes to the cultivation of the crops seed is the important input. At harvest, the seeds are of good quality but by the time it reaches the farmers hands, would have deteriorated in quality. India is a country where farmers reserve the seeds for the cultivation purpose to the next season. The reserved seeds become aged and soon lose their viability leading to less germination percentage and poor vigour index.

Pre - sowing treatment which helps in enhancing seed quality like uniform germination vigour, viability and optimum plant stand

in the field. Antioxidant is any substance that delays, prevents or removes oxidative damage to a target molecule. This includes compounds of a non-enzymatic as well as an enzymatic nature. Such organic molecules can come for the rescue for aging of seeds [1].

Grapes (*Vitis vinifera*) belonging to the Vitaceae family contains polyphenol compounds in its juice and seeds. The main grape seed phenolic compounds include anthocyanins, flavan-3-ols, flavonols, stilbenes, and phenolic acids [2,3].

Considering the issues faced by the farmers and to catch on an easier solution using the grape extracts, the present study was undertaken by treating the aged seeds of rice, sorghum, black gram and green gram with the extracts from black grape juice and seed.

As a result of this research the antioxidant potential of grapes (juice and seed) extract on enhancing vigour and viability of aged seeds could be used to overcome the disputes faced by the farmers.

Materials and Method

The aged seeds of Black gram, green gram, Paddy and sorghum were collected by first four authors from the seasonal farmers in their native places. These seeds were more than a year old and were reserved by the farmers for sowing in the next season.

The treatment for the collected seeds fixed as control, four hours priming in water, grape juice extract 5%, grape juice extract 10%, grape seed extract 5%, and grape seed extract 10% with 4 replications each. The treated seeds were assessed for the seed growth parameters viz., germination percentage, speed of germination, shoot length, root length and vigour index through roll towel method in germination paper. The treatments were conducted in three replications each and formulated in Completely Randomised Design for analysis of their worthiness during the year 2021 at the room temperature condition.

Results and Discussion

The results of the present study for each crop are furnished in the tables 1 and 2. The seed priming with water, grape juice and seed extract had a significant effect on the seed germination, seedling length and vigour index of all the crops under study viz., Paddy, Sorghum, Black gram and Green gram and all the treatments under study was distinctly different from each other which is evident from the ANOVA of the treatments (Table 1). The results of the pres-

ent investigation are akin with that of [4]. All the crop seeds viz., Paddy, Sorghum, Black gram and Green gram treated with grape seed extract at 10% showed maximum speed of germination and germination percentage, maximum shoot length, root length and vigour index followed by grape juice treatment (Table 2). In all the crops, the seed germination parameters were significantly higher than their respective control and water priming treatment. The results arrived here in this experiment are akin with that obtained by [5-11]. The par chart of the various treatments under study is given in the figure 2.

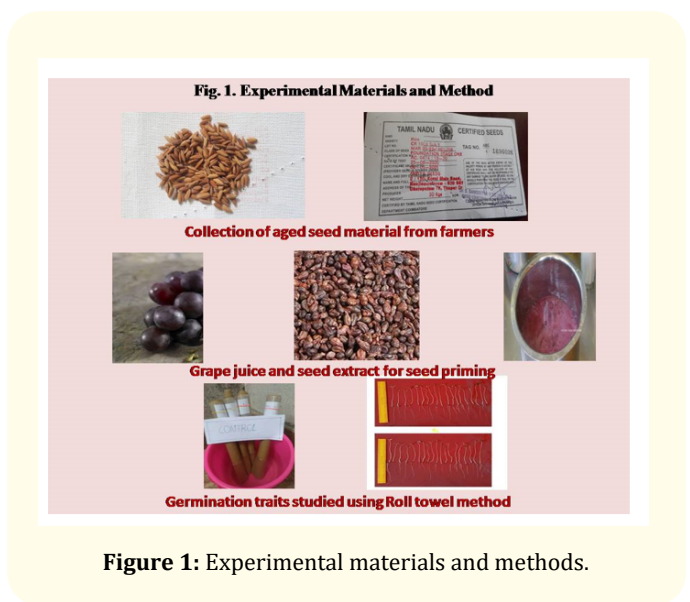


Figure 1: Experimental materials and methods.

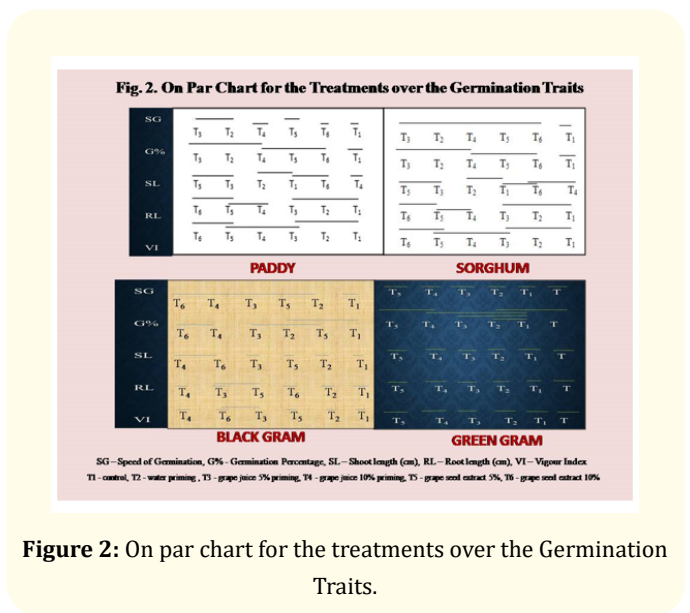


Figure 2: On par chart for the treatments over the Germination Traits.

Error	Treatment	Source	Black gram		Error	Treatment	Source	Paddy		Error	Treatment	Source	Sorghum				
0.44	1.69*	SG	MSS		0.54	2.01*	SG	MSS		19097	197856*	VI	MSS				
	0.99		CD at 5%			0.99		CD at 5%			203.03		CD at 5%				
2.56	33.5*	G%	MSS		2.49	32.8*	G%	MSS		0.35	50.72*	RL	MSS				
	2.37		CD at 5%			2.37		CD at 5%			0.84		CD at 5%				
0.41	52.31*	SL	MSS		0.49	45.05*	SL	MSS		19097	186256*	VI	MSS				
	0.96		CD at 5%			0.96		CD at 5%			203.03		CD at 5%				
0.32	60.72*	RL	MSS		0.35	50.72*	RL	MSS		0.54	1.91*	SG	MSS				
	0.84		CD at 5%			0.84		CD at 5%			0.99		CD at 5%				
18695	189038*	VI	MSS		19097	197856*	VI	MSS		0.54	1.91*	SG	MSS				
	203.03		CD at 5%			203.03		CD at 5%			0.99		CD at 5%				
0.35	1.53*	SG	MSS		0.54	1.91*	SG	MSS		2.49	34.1*	G%	MSS				
	0.87		CD at 5%			0.99		CD at 5%			2.37		CD at 5%				
6.67	22.4*	G%	MSS		2.49	34.1*	G%	MSS		0.49	41.05*	SL	MSS				
	3.83		CD at 5%			2.37		CD at 5%			0.96		CD at 5%				
0.34	76.85*	SL	MSS		0.49	41.05*	SL	MSS		0.35	48.72*	RL	MSS				
	0.87		CD at 5%			0.96		CD at 5%			0.84		CD at 5%				
0.16	61.45*	RL	MSS		0.35	48.72*	RL	MSS		19097	186256*	VI	MSS				
	0.60		CD at 5%			0.84		CD at 5%			203.0		CD at 5%				
94956	211097*	VI	MSS		19097	186256*	VI	MSS		0.35	48.72*	RL	MSS				
	144.7		CD at 5%			203.0		CD at 5%			203.0		CD at 5%				

Table 1: ANOVA for seed germination traits treated with grape extracts.

SG: Speed of Germination, G%: Germination Percentage, SL: Shoot length (cm), RL: Root length (cm), VI: Vigour Index

Treatment	Paddy					Sorghum				
	SG	G%	SL	RL	VI	SG	G%	SL	RL	VI
Control	8.78	63	4.42	3.43	494	6.33	77.5	7.08	3.88	851.04
Water priming	15.02	66.5	4.52	3.44	527.35	12.75	80.5	9.31	4.98	1149.43
Grape seed 5% priming	16.48	66.5	5.45	4.25	629.60	21.58	93.21	16.32	7.82	2242.44
Grape seed 10 % priming	18.62	68.5	6.62	4.45	755.50	24.42	95.5	17.82	8.22	2488.078
Grape juice 5% priming	21.92	68	7.05	4.85	810.81	17.78	87.25	11.02	6.02	1483.64
Grape juice 10% priming	24.82*	69.5*	8.62*	5.54*	982.22*	18.75	86.50	14.31	7.12	1856.42
Mean	17.60	67	6.10	4.26	699.90	16.93	86.67	12.64	6.34	1678.51
SE	2.29	0.93	0.66	0.33	75.76	2.66	2.83	1.70	0.69	258.69
	Black gram					Green gram				
Treatment	SG	G%	SL	RL	VI	SG	G%	SL	RL	VI
Control	9.75	81.00	12.29	7.36	1591.73	8.37	78.00	6.91	3.83	835.53
Water priming	10.89	83.00	13.91	8.31	1844.26	13.17	80.00	9.29	6.10	1230.04
Grape seed 5% priming	11.27*	85.00	18.73*	14.06*	2787.78*	17.50	80.00	10.99	7.82	1505.72
Grape seed 10 % priming	11.42*	87.50*	21.08*	17.90*	3412.57*	20.50*	81.00	14.24*	9.91*	1955.42*
Grape juice 5% priming	10.96	83.00	16.22	13.35	2454.17	23.00*	82.00	15.85*	11.85*	2273.72*
Grape juice 10% priming	11.54*	88.50*	20.68*	12.49	2936.41*	24.63*	85.00*	18.67*	14.59*	2826.40*
Mean	10.97	84.67	17.15	12.24	2504.48	17.86	81.00	12.66	9.02	1771.14
SE	0.33	0.80	0.32	0.28	68.37	0.29	1.29	0.29	0.20	48.72

Table 2: Effect of seed treatment with grape extracts (Juice and Seed) on seed germination traits.

SG: Speed of Germination, G%: Germination Percentage, SL: Shoot length (cm), RL: Root length (cm), VI: Vigour Index

Thus, it could be concluded that the seed germination parameters in aged seeds can be successfully enhanced by grape juice as well as grape seed extract. The study gives a useful outcome for the farmers who have the habit of storing seed materials for long time to be sown in the next generation. In this way, the loss due to seed quality deterioration can be avoided. Henceforth, the research project is worth of utility to the farming community, which could be practiced by the farmers themselves without the requirement of any sophisticated technology.

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