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## INVIGORATIVE INFLUENCE OF HERBAL POWDERS ON SEED QUALITY CHARACTERS OF MAJOR PULSES

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### KEYWORDS

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## ABSTRACT

Pulses are the major food crop of India and organic seed production fetches much importance in these crops as this serves as the major constituent of daily food of major population. Hence, studies were initiated to evaluate the influence of herbal powders (noni and basil leaf powder and gallnut fruit powder) as presowing seed treatments imposed as seed fortification on the invigorative influence of major pulses along with hydroprimed and untreated seed. The results indicated that seed priming with two per cent holy basil extract invigorated the pulse seed and improved the field emergence by 8, 8 and 7 per cent compared to control and by 7, 6 and 6 per cent compared to water soaking. Therefore, it was concluded that seed priming with two per cent holy basil extract invigorated the pulse seed.

## INTRODUCTION

Pulses are one of the major nutritive food crop of India. India ranks first in terms production, consumption and acreage of pulses. The major constraint in pulse production is the lower productivity per unit area, which has been focused to the use of poor quality seeds for sowing. Seed quality is the pre-requisite for the maintenance of planting value (Khatun *et al.*, 2011) and several seed management techniques are being practiced to enhance the planting value of the seed. One such seed management technique is the seed priming. Seed priming is the process of activation of seed vigour where seeds are germinated to certain level and are dried back to their original moisture, which promote easy handling of seed (Varier *et al.*, 2010). But seed priming is influenced by several factors such as temperature, seed to solution ratio, soaking duration, priming agents and their concentration (Anbarasan and Srimathi, 2015). Simple seed priming has been claimed to promote the productivity (Agawane and Parhe, 2015) and extend the storage life of seed (Hareesh *et al.*, 2014).

In development of the eco-friendly production techniques for promotion of organic farming usage of natural products fetches much importance among the various seed crop management techniques, pre sowing seed invigoration technique occupies a major role. Scientists have also proven the efficacy of botanical products as priming agent (Khidrapure *et al.*, 2015 and Sathish and Bhaskaran, 2013). Hence studies were initiated to evaluate the efficacy of leaf powder of noni (*Morinda citrifolia*) and basil (*Ocimum sanctum*) and fruit powder of gallnut (*Terminalia chebula*) on seed invigoration in pulses as all the said crops are well known for their medicinal properties and pulses taken for the study were the redgram, blackgram and greengram which are the major food crop.

## MATERIALS AND METHODS

Genetically pure seeds of red gram cv. CO 7, greengram cv. CO 7 and blackgram cv. ADT 3 were obtained from Dept. of Pulses, Tamil Nadu Agricultural University, Coimbatore and Tamil Nadu Rice Research Institute, Aduthurai and were graded with BSS 5 x 5, BSS 7 x 7 and BSS 7 x 7 sieves respectively for obtaining homogeneity of seed lot based on size. Fresh matured leaves (middle portion of the plant) of noni (*Morinda citrifolia*) and basil (*Ocimum sanctum*) from middle portion of plant and dried fruits of gallnut (*Terminalia chebula*) were collected. The leaves were dried under sun for a week, powdered in a mixer grinder and sieved through 0.250 mm sieve to obtain fine herbal powder. Similarly, gallnut fruit was separated as nut and mesocarp and the mesocarp alone were finely powdered in a mixer grinder and sieved through 0.250 mm sieve to obtain fine herbal powder. The powders were soaked as 100g in 100ml of water under room temperature to obtain the 100 per cent solution, where the solution was filtered through Whatman No. 1 filter paper. Then the 100 per cent solution was diluted with distilled water to obtain 0.5, 1, 2 and 5 per cent solution. The graded seeds of each of the crop were soaked in equal volume (w/v) for 1 hour in different concentrations of herbal extracts viz., noni (*Morinda citrifolia*), holy basil (*Ocimum sanctum*) and gallnut (*Terminalia chebula*)

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along with water. The soaked seeds along with unsoaked dry seed were surface dried for one day under laboratory conditions and were evaluated for the initial seed and seedling quality characteristics under the germination room condition (25° C and 95 ± 2% RH) as per ISTA (2013). The seeds as 4 x 100 were evaluation of seedling vigour and germination potential roll towel method was adopted and at the end of the germination period, the germination test was evaluated as normal seedlings, abnormal seedlings and dead seed (there were no hard seeds) and the germination was reported in percentage adopting the following formula as per ISTA, (2013) based on the normal seedling percentage.

$$\text{Germination (\%)} = \frac{\text{Number of normal seedlings}}{\text{Total number of seeds placed for germination}} \times 100$$

Among the vigour index values were computed adopting the following formula Abdul-Baki and Anderson (1973) and the values were reported as whole number without unit.

$$\text{Vigour index} = \text{Germination (\%)} \times \text{total seedling length (cm)}$$

The seeds were also germinated in pots filled with potting mixture (Soil: Sand: FYM) for evaluation of field emergence using 50 x 4 seeds and the results were reported in percentage.

The treated seeds were also evaluated for the DPPH test (Koleckar *et al.*, 2007) and dehydrogenase enzyme activity (Kittock and Law, 1968) to trace the causes for the seed invigorative influence. The data collected were statistically scrutinized as per Rangaswamy (2002) for understanding the significance at 0.5 per cent. The percentage values were converted to arcsine values, while non significant results were indicated as NS.

## RESULTS AND DISCUSSION

Adoption of suitable seed management practice before sowing is necessary to trigger the seedling emergence and establishment of pre-sowing treatments shortens the emergence period from sowing and enhanced the growth rate of seedling (Tzortzakis, 2009). Austin *et al.* (1973) also reported that seed treatment before sowing confers the crop performance in the field. In the present investigation among the herbal powders, the performance of herbal powders irrespective of crop and concentration were higher with treated seed than with hydroprimed (water) and untreated control seeds (Table 1). Among the herbal powders, the invigorative efficacy was higher with basil leaf powder irrespective of crops and it was followed by noni leaf powder and gallnut fruit powder. Among the various concentrations 2 per cent irrespective of herbal

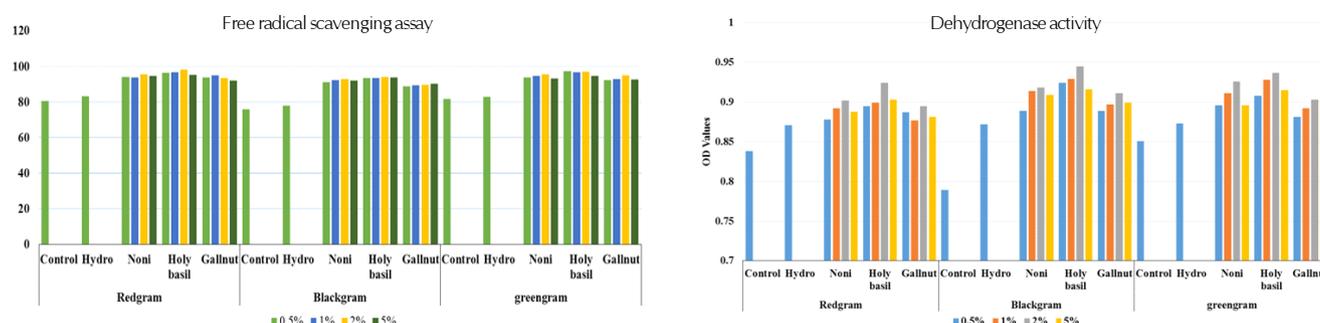


Figure 1: Influence of seed priming with herbal powders on free radical scavenging activity and dehydrogenase activity in pulses

Table 1: Influence of seed priming with herbal powders on seed germination and vigour index in pulses (increase over individual treatment (%))

Herbal powders / Concentrations (%)	Improvement in primed seed germination Compared to control (%)						Improvement in vigour index of primed seed Compared to control (%)					
	Compared to control (%)			Compared to hydro primed seeds (%)			Compared to control (%)			Compared to hydro primed seeds (%)		
	Red gram	Black gram	Green gram	Red gram	Black gram	Green gram	Red gram	Black gram	Green gram	Red gram	Black gram	Green gram
<b>Noni</b>												
0.5	8	5	2	6	1	0	20	7	7	14	2	1
1	9	12	10	7	8	7	25	18	18	18	12	12
2	4	10	6	2	6	3	21	16	15	15	11	10
5	4	10	5	2	6	2	21	13	12	15	8	7
<b>Holy basil</b>												
0.5	5	7	2	4	3	0	15	11	7	9	6	1
1	9	7	6	7	3	3	24	12	14	17	7	8
2	10	12	8	9	7	6	32	20	21	25	15	15
5	6	6	8	5	2	6	25	13	17	19	8	11
<b>Gallnut</b>												
0.5	1	5	6	0	1	3	13	7	10	7	2	5
1	4	10	4	2	6	1	19	11	11	13	6	5
2	6	10	7	5	6	5	27	14	15	21	9	9
5	4	12	7	2	8	5	20	19	11	14	14	5

**Table 2: Influence of seed priming with herbal powders on field emergence in pulses.**

Herbal powders (H)	Concentrations of extract (C)					Mean
	0%	0.5%	1%	2%	5%	
<b>Redgram</b>						
Control	79 (62.72)					79 (62.72)
Hydro	80 (63.43)					80 (63.43)
Noni		84 (66.42)	83 (65.65)	86 (68.02)	84 (66.42)	84 (66.42)
Holy basil		85 (67.21)	85 (67.21)	87 (68.86)	86 (68.02)	86 (68.02)
Gallnut		82 (64.89)	84 (66.42)	85 (67.21)	84 (66.42)	84 (66.42)
Mean		84 (66.42)	84 (66.42)	86 (68.02)	85 (67.21)	85 (67.21)
Level of significance		Cont. vs Rest	H	C	H × C	
SEd		1.01	0.68	0.79	1.37	
CD (p = 0.05)		2.08**	1.41*	1.63*	NS	
<b>Blackgram</b>						
Control	80 (63.43)					80 (63.43)
Hydro	82 (64.89)					82 (64.89)
Noni		84 (66.42)	85 (67.21)	87 (68.86)	86 (68.02)	86 (68.02)
Holy basil		85 (67.21)	87 (68.86)	88 (69.73)	85 (67.21)	86 (68.02)
Gallnut		84 (66.42)	86 (68.02)	85 (67.21)	85 (67.21)	85 (67.21)
Mean		84 (66.42)	86 (68.02)	87 (68.86)	85 (67.21)	86 (68.02)
Level of Significance		Cont. vs Rest	H	C	H × C	
SEd		0.65	0.44	0.51	0.88	
CD (P = 0.05)		1.34**	0.91*	1.05**	NS	
<b>Greengram</b>						
Control	82 (64.89)					82 (64.89)
Hydro	83 (65.65)					83 (65.65)
Noni		85 (67.21)	85 (67.21)	88 (69.73)	86 (68.02)	86 (68.02)
Holy basil		87 (68.86)	87 (68.86)	89 (70.63)	85 (67.21)	87 (68.86)
Gallnut		85 (67.21)	86 (68.02)	86 (68.02)	87 (68.86)	86 (68.02)
Mean		86 (68.02)	86 (68.02)	88 (69.73)	86 (68.02)	86 (68.02)
Level of Significance		Cont. vs Rest	H	C	H × C	
SEd		0.65	0.44	0.51	0.89	
CD (p = 0.05)		1.35**	0.91*	1.06**	1.83*	

(Figures in parenthesis indicate arcsine values)

**Table 3: The invigorative influence of herbal powders**

Plants	Chemical compounds	Authority
Noni	Scopoletin, Octoanoic acid, Potassium, Vitamin C and A, Terpenoids, Alkaloids, Anthraquinones, Amino acids, Acubin, L-asperuloside, Alizarin and Xeronine	Wang <i>et al.</i> , 2002 and Chandra and Sagar, 2013
Holy basil	Eugenol, Urosolic acid, Carvacrol, Linalool, Caryophylline, Estragol, Vitamin C, A and E, Calcium, Phosphours, Chromium, Copper, Carotene, Zink, Iron and Nicke,	Anbarasu and Vijayalakshmi, 2007 and Pattanayak <i>et al.</i> , 2010
Gallnut	Tannins, Chebulinic acid, Ellagic acid, Gallic acid, Punicalagin, Flavonoids, Vitamin C, Protein, Amino acids and Minerals,	Mahesh <i>et al.</i> , 2007 and Suryaprakash <i>et al.</i> , 2012

powders performed well in all the crops, which showed improvement in germination and vigour (as expressed through vigour index).

The evaluation on field emergence was also highlighted that irrespective of crop 2 % basil extract out beaten the other herbal powders and laid the confirmative influence on improving the seedling vigour of crop seeds (Table 2). On evaluation of the causes for the influence the antioxidant and dehydrogenase activity analysis supported the present results (Fig. 1) highlighting the efficacy of herbal powders for their invigorative effect by exerting a positive influence with physiological seed quality characters. The invigorative influence of herbal powders could also be due the possession of secondary metabolites, antioxidants, growth regulatory substance and the micro nutrients as indicated by the scientists as shown in Table 3.

Thus the study indicated that seed priming with two per cent basil extract invigourated the pulse seed and improved the

field emergence and the causes for seed invigouration was found to be the promotion of enzymatic activity that triggered the seeds for early emergence and better expression of seedling vigour.

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