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Effect of Quality of Mungbean on Seed Impaction and Foliar Spray of Panchgavya

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Abstract
A field experiment entitled "Effect of Quality of Mungbeanon Seed Impaction and Foliar Spray of Panchgavya" was conducted at Agronomy farmVivekananda Global University, Jaipur (Rajasthan) during the *Kharif* season, 2024 on loamy sand soil. The mungbean crop under the influence of seed impaction with $CaCl_2$ @ 2% recorded significantly higher growth parameters *viz.*, it was recorded maximum nitrogen content, protein content, total nitrogen uptake, phosphorus uptake and potassium uptake along with but significantly higher than control.Foliar spray of panchgavya @ 5% significantly showed improved growth parameters *viz.*, Foliar spray of panchgavya @ 5% also recorded higher N, P, K content, protein content, total nitrogen uptake, phosphorus uptake and potassium uptakeover rest of the treatmentsand control.

Keywords: Foliar spray and Panchgavya

Introduction
Pulses, or grain legumes, hold a crucial position in global agriculture as the second most important crop group after cereals. They are a major source of dietary protein, particularly in countries like India where a significant portion of the population follows a vegetarian diet. India leads the world in the production, import and consumption of pulses. Among the diverse range of pulses grown in India, mungbean (*Vignaradiata* L.; 2n = 2x = 22), also known as green gram, plays a vital role due to its rich nutritional profile, short growing period and adaptability to various agro-climatic conditions. It provides around 24.5% protein and is a good source of essential amino acids such as lysine and tryptophan (Potter & Hotchkiss, 1998). Additionally, mungbean enhances soil fertility through nitrogen fixation, making it highly suitable for dryland and sustainable farming systems (Kannaiyan, 1999; Dahiya *et al.*, 2015) [8, 3]. It ranks third among pulses in terms of area and production. Despite its importance, the crop's productivity and quality remains still low due to several challenges, including poor seed quality, cultivation on nutrient-poor soils, moisture stress and minimal input use (Kamara *et al.*, 2019) [7].

To overcome these constraints and enhance both productivity and quality in mungbean, the adoption of integrated and eco-friendly agronomic practices has become essential. One such approach is seed impaction, a pre-sowing physiological treatment involving controlled hydration followed by drying. This method induces biochemical and structural changes in the seed, improving its ability to withstand moisture stress and enhancing germination, root growth and seedling establishment (Henckel, 1964; Prajapati, 2017; Bhadane *et al.*, 2022) [6, 10]. The application of inorganic salts like KNO_3, $CaCl_2$, and KH_2PO_4 during impaction has shown to improve nutrient absorption and drought resistance in dryland crops, including mungbean (Henckel, 1964) [6].

In arid and nutrient-deficient soils, where traditional soil fertilization is often ineffective, foliar application of nutrients has emerged as an efficient strategy to enhance crop growth and yield. This method involves spraying nutrients, plant hormones and bio-stimulants directly onto the leaves, ensuring rapid absorption and minimizing losses due to leaching or fixation (Krishnaveni *et al*., 2004) [9]. Foliar feeding is particularly useful during critical crop growth stages and under stress conditions, where it improves plant vigor, drought tolerance and overall productivity (Alshaal& El-Ramady, 2017). Among the various organic formulations Panchgavya, a traditional Indian formulation comprising cow

dung, urine, milk, curd and ghee, has gained prominence as an eco-friendly growth enhancer. It is rich in essential macro and micronutrients, beneficial microbes and plant growth hormones like indole-3-acetic acid (IAA) and gibberellic acid (GA), which support crop development and yield enhancement (Somasundaram *et al.*, 2007; Vallimayil & Sekar, 2012) [13, 17]. Studies have shown that foliar application of panchgavya not only improves nutrient uptake and photosynthesis but also strengthens plant immunity and contributes to sustainable agricultural practices (Selvaraj *et al.*, 2007) [11].

Materials and methods

A field experiment entitled "Effect of Quality of Mungbeanon Seed Impaction and Foliar Spray of Panchgavya" was conducted at Agronomy farm, Vivekananda Global University, Jaipur (Rajasthan) during the *Kharif* season, 2024 on loamy sand soil. The experiment was laid out in factorial randomized block design comprising combinations of five seed impaction treatments (control, $CaCl_2$ @ 2%, KH_2PO_4 @ 2%, KNO_3 @ 1%, KCl @ 1%) and four foliar sprays of panchgavya (control, 1%, 3%, 5%). The climate of this region is a typically semi-arid, characterized by extremes of temperature during both summers and winters. The observation were recorded was analysed by statistical methods (Fisher, R.A. 1950) [4].

Results and Discussion

Nutrient content and uptake

Effect of seed impaction

An examination of data (Table 1) showed that different seed impaction treatments exerted their significant influence on nitrogen content in seed. Seed impaction with $CaCl_2$ @ 2% recorded significantly the highest nitrogen content in seed (3.42%), treatment KNO_3 @ 1%, KH_2PO_4 @ 2% and KCl @ 1% remained at par to each other but significantly higher than control. Whereas, the lowest nitrogen content in seed (2.96%) was noticed under control.

Effect of panchgavya

An appraisal of data (Table 4.1) explained that various levels of panchgavya imparted their significant influence on nitrogen content in seed. Foliar spray of panchgavya @ 5% recorded significantly the highest nitrogen content in seed (3.44%) superior over rest of the treatments. Whereas, the lowest nitrogen content in seed (2.97%) was registered under control.

Effect of seed impaction

Seed impaction with $CaCl_2$ @ 2% recorded significantly the highest nitrogen content in haulm (1.31%), treatment KNO_3 @ 1%, KH_2PO_4 @ 2% and KCl @ 1% remained at par to each other but significantly higher than control. Whereas, the lowest nitrogen content in haulm (1.12%) was noticed under control.

Effect of panchgavya

An appraisal of data (Table 4.1) revealed that different levels of panchgavya imparted their significant influence on nitrogen content in haulm. Foliar spray of panchgavya @ 5% recorded significantly the highest nitrogen content in haulm (1.29%) superior over rest of the treatments. Whereas, the lowest nitrogen content in haulm (1.13%) was registered under control.

Nitrogen uptake

Effect of seed impaction

An examination of data (Table. 1) showed that different seed impaction treatments exerted their significant influence on total nitrogen uptake by mungbean. Seed impaction with $CaCl_2$ @ 2% recorded significantly the highest total nitrogen uptake (63.26 kg/ha), treatment KNO_3 @ 1%, KH_2PO_4 @ 2% and KCl @ 1% remained at par to each other but significantly higher than control. Whereas, the lowest total nitrogen uptake (43.52 kg/ha) was noticed under control.

Effect of panchgavya

An appraisal of data (Table 1) revealed that different levels of panchgavya imparted their significant influence on total nitrogen uptake. Foliar spray of panchgavya @ 5% recorded significantly the highest total nitrogen uptake (63.13 kg/ha) superior over rest of the treatments. Whereas, the lowest total nitrogen uptake (45.80 kg/ha) was registered under control.

Protein content in seed

Effect of seed impaction

An examination of data (Table 2) showed that seed impaction treatment significantly influenced protein content in seed. Seed impaction with $CaCl_2$ @ 2% recorded significantly maximum protein content in seed (21.38%), treatment KNO_3 @ 1%, KH_2PO_4 @ 2% and KCl @ 1% remained at par to each other but significantly higher than control. Whereas, the lowest protein content in seed (18.50%) was noticed under control.

Effect of panchgavya

An appraisal of data (Table 2) explained that various levels of panchgavya exerted their significant influence on protein content in seed. Foliar spray of panchgavya @ 5% recorded significantly the highest protein content in seed (21.50%) superior over rest of the treatments. Whereas, the lowest protein content in seed (18.56%) was registered under control.

Phosphorus content in seed

Effect of seed impaction

Data presented in table 2 revealed that treatment of seed impaction did not differ significantly in reference to phosphorus content in seed.

Effect of panchgavya

An appraisal of data (Table 2) revealed that different levels of panchgavya imparted their significant influence on phosphorus content in seed. Foliar spray of panchgavya @ 5% recorded significantly the highest phosphorus content in seed (0.773%) superior over rest of the treatments. Whereas, the lowest phosphorus content in seed (0.740%) was registered under control.

Phosphorus content in haulm

Effect of seed impaction

Data presented in table 2 revealed that treatment of seed impaction did not differ significantly in reference to phosphorus content in haulm.

Effect of panchgavya

An appraisal of data (Table 2) revealed that different levels of panchgavya imparted their significant influence on

phosphorus content in haulm. Foliar spray of panchgavya @ 5% recorded significantly the highest phosphorus content in haulm (0.249%) superior over rest of the treatments. Whereas, the lowest phosphorus content in haulm (0.241%) was registered under control.

Phosphorus uptake

Effect of seed impaction

The perusal data (Table 2) showed that different seed impaction treatments significantly influenced total phosphorus uptake. Seed impaction with $CaCl_2$ @ 2% recorded significantly the highest total phosphorus uptake (13.19 kg/ha), treatment KNO_3 @ 1%, KH_2PO_4 @ 2% and KCl @ 1% remained at par to each other but significantly higher than control. Whereas, the lowest total phosphorus uptake (10.14 kg/ha) was noticed under control.

Effect of panchgavya

The critical data (Table 2) revealed that different levels of panchgavya imparted their significant influence on total phosphorus uptake. Foliar spray of panchgavya @ 5% recorded significantly the highest total phosphorus uptake (13.76 kg/ha) superior over rest of the treatments. Whereas, the lowest total phosphorus uptake (10.24 kg/ha) was registered under control.

Table 1: Effect of seed impaction and foliar spray of panchgavya on nitrogen content in seed, haulm and its uptake and protein content in mungbean

Treatment	Nitrogen content (%)		Nitrogen uptake (kg/ha)	Protein content (%)
	Seed	Haulm		
Seed impaction				
Control	2.96	1.12	43.52	18.50
$CaCl_2$ @ 2%	3.42	1.31	63.26	21.38
KH_2PO_4 @ 2%	3.24	1.21	55.18	20.25
KNO_3 @ 1%	3.27	1.24	56.52	20.44
KCl @ 1%	3.16	1.18	53.44	19.75
SEm±	0.05	0.019	1.36	0.29
CD (P=0.05)	0.13	0.054	3.87	0.82
Foliar spray of panchgavya				
Control	2.97	1.13	45.80	18.56
Panchgavya @ 1%	3.13	1.19	51.42	19.56
Panchgavya @ 3%	3.3	1.24	57.22	20.63
Panchgavya @ 5%	3.44	1.292	63.13	21.50
SEm±	0.04	0.017	1.21	0.26
CD (P=0.05)	0.12	0.048	3.46	0.73

Potassium content in seed

Effect of seed impaction

Data presented in table 3 revealed that treatment of seed impaction did not differ significantly in reference to potassium content in seed.

Effect of panchgavya

An appraisal of data (Table 3) revealed that different levels of panchgavya imparted their significant influence on potassium content in seed. Foliar spray of panchgavya @ 5% recorded significantly the highest potassium content in seed (0.776%) superior over rest of the treatments. Whereas, the lowest potassium content in seed (0.696%) was registered under control. The increase in potassium content in seed due to foliar spray of panchgavya @ 5% was 11.49 per cent over control; 7.77 per cent over panchgavya @ 1%; and 3.60 per cent over panchgavya @ 3%.

Table 2: Effect of seed impaction and foliar spray of panchgavya on phosphorus content in seed, haulm and its uptake by mungbean

Treatment	Phosphorus content (%)		Phosphorus uptake (kg/ha)
	Seed	Haulm	
Seed impaction			
Control	0.740	0.241	10.14
$CaCl_2$ @ 2%	0.773	0.249	13.19
KH_2PO_4 @ 2%	0.762	0.246	12.13
KNO_3 @ 1%	0.772	0.248	12.35
KCl @ 1%	0.742	0.242	11.78
SEm±	0.010	0.003	0.34
CD (P=0.05)	NS	NS	0.98
Foliar spray of panchgavya			
Control	0.715	0.232	10.24
Panchgavya @ 1%	0.74	0.24	11.29
Panchgavya @ 3%	0.775	0.249	12.50
Panchgavya @ 5%	0.801	0.261	13.76
SEm±	0.009	0.003	0.31
CD (P=0.05)	0.024	0.007	0.88

Potassium content in haulm

Effect of seed impaction

Data presented in table 3 revealed that treatment of seed impaction did not differ significantly in reference to potassium content in haulm.

Effect of panchgavya

An appraisal of data (Table 3) revealed that different levels of panchgavya imparted their significant influence on potassium content in haulm. Foliar spray of panchgavya @ 5% recorded significantly the highest potassium content in haulm (1.665%) superior over rest of the treatments. Whereas, the lowest potassium content in haulm (1.495%) was registered under control.

Potassium uptake

Effect of seed impaction

The perusal data (Table 3) showed that different seed impaction treatments significantly influenced total potassium uptake. Seed impaction with $CaCl_2$ @ 2% recorded significantly the highest total potassium uptake (46.16 kg/ha), treatment KNO_3 @ 1%, KH_2PO_4 @ 2% and KCl @ 1% remained at par to each other but significantly higher than control. Whereas, the lowest total potassium uptake (44.03 kg/ha) was noticed under control.

Table 3: Effect of seed impaction and foliar spray of panchgavya on potassium content in seed, haulm and its uptake by mungbean

Treatment	Potassium content (%)		Potassium uptake (kg/ha)
	Seed	Haulm	
Seed impaction			
Control	0.677	1.495	33.38
$CaCl_2$ @ 2%	0.757	1.665	46.16
KH_2PO_4 @ 2%	0.728	1.585	41.14
KNO_3 @ 1%	0.73	1.605	41.84
KCl @ 1%	0.725	1.565	40.42
SEm±	0.008	0.018	1.14
CD (P=0.05)	NS	NS	3.25
Foliar spray of panchgavya			
Control	0.665	1.475	34.38
Panchgavya @ 1%	0.745	1.645	40.78
Panchgavya @ 3%	0.716	1.565	41.17
Panchgavya @ 5%	0.718	1.585	44.03
SEm±	0.007	0.016	1.02
CD (P=0.05)	0.021	0.045	2.91
CV	3.81	3.80	9.41

Effect of panchgavya

The critical data (Table 3) revealed that different levels of panchgavya imparted their significant influence on total potassium uptake. Foliar spray of panchgavya @ 5% recorded significantly the highest total potassium uptake (44.03 kg/ha) superior over rest of the treatments. Whereas, the lowest total potassium uptake (34.38 kg/ha) was registered under control.

Seed impaction treatments significantly influenced nitrogen content and protein content in seed and haulm. The $CaCl_2$ @ 2% treatment recorded the highest nitrogen content, which was associated with enhanced nodulation and nitrogen fixation efficiency. These findings are in agreement with Subramaniyan *et al.* (2001) [16], who reported that calcium enhances the activity of nitrate reductase and glutamine synthetase, thus supporting nitrogen assimilation and protein synthesis. Total nutrient uptake (N,P and K) was also highest in $CaCl_2$ @ 2%, while phosphorus and potassium contents in seed and haulm were found to be statistically non-significant.Protein content in seed, a direct outcome of increased nitrogen assimilation, was significantly higher under $CaCl_2$ priming, aligning with the results of Bhanu *et al.* (2015) [2], who reported better protein accumulation in nutrient-primed mungbean. The comparable performance of KNO_3, KH_2PO_4, and KCl indicates their supportive role in nutrient absorption and metabolic enhancement during the reproductive phase.

Foliar spray of panchgavya @ 5% also significantly improved quality parameters. It recorded the highest nitrogen, phosphorus and potassium content in seed and haulm, along with total nutrient uptake and protein content in seed. These enhancements can be credited to the microbial and enzymatic components of panchgavya that improve soil health, nutrient solubilization and root efficiency (Ghosh *et al.*, 2016; AOAC, 1990) [5, 1]. Panchgavya's ability to stimulate nitrogen fixation, solubilize phosphorus, and mobilize potassium has been well documented by Somasundaram *et al.* (2003) [12], and the present results are in line with those findings. The lowest nutrient content and uptake values were consistently observed under the control.

Conclusion

Based on the results obtained from the above investigation, it may be concluded that seed impaction with $CaCl_2$ @ 2% and foliar spray of panchgavya @ 5% significantly improved the quality of mungbean.

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