

Original Research Article

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Effect of Leaf Extracts and Panchagavya Foliar Spray on Plant Characters, Yield and Resultant Seed Quality of Blackgram [*Vigna mungo* (L.) Hepper] cv. CO 6

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ABSTRACT

Keywords

Field trial, Foliar spray, Panchagavya, Moringa leaf extract, Prosopis leaf extract, Neem leaf extract, Yield and resultant seed quality

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The field trial was conducted to study the effect of leaf extracts and panchagavya foliar spray on plant characters, yield and resultant seed quality of blackgram. The blackgram plants were subjected to foliar spray viz., Moringa leaf extract 3%, Panchagavya 3%, Prosopis leaf extract 3% and Neem leaf extract 3% along with control. In field trial, Panchagavya 3% foliar spray recorded higher values for plant characters and yield such as plant height, days to 1st flowering, days to 50% flowering, number of leaves per plant, number of branches per plant, number of pods per plant, pod length, number of seeds per pod, seed yield per plant, seed yield per plot, 100 seed weight and the resultant seed quality from the same treatment registered best seed quality.

Introduction

Blackgram (*Vigna mungo* L.) also known as “Urad” one of the most important pulse crops grown all over India. It is also grown in tropics and sub tropic countries. It is mostly consumed as pulse and in the preparation of typical Indian dishes like pappad, idli, dosa and vada (Indira and Kurup, 2003). In India the blackgram production is estimated to achieve 2.89 lakh tonnes during the year (2016

– 2017) (Anon, 2017). Blackgram contains higher amount of protein (24-26%) and is reported to be rich in Potassium (K), Phosphorus (P) and Calcium (Ca) with good amount of Sodium (Na) (Eswara Raghava Kumari *et al.*, 2018). The potential of blackgram is very low due to various physiological, biochemical as well as inherent factors associated with the crops (Devaraju and Senthivel, 2018). The low productivity of blackgram was due to delayed monsoon, non-

availability of high yielding varieties and low soil fertility. One among the best methods to overcome this situation is foliar spray. Foliar spray is a technique of feeding plants by applying liquid formulations directly to their leaves. Plants are able to absorb essential elements through their leaves. The absorption takes place through their stomata and also through their epidermis. Foliar spraying also stimulates nutrient uptake from the soil.

Foliar spray reduces the loss of fertilizers through absorption, leaching or other process associated with soil application with normal moisture availability or normal soil condition. Foliar spray of nutrients using water soluble fertilizer is one of the possible ways to enhance the productivity of pulses like greengram and blackgram. Secondly, foliar feeding can be effective management tool to favourably influence pre-reproductive growth stages by compensating for environmentally induced stresses of adverse growing conditions or poor nutrient availability. Early foliar applications can make an already good crop better, either by stimulating more vigorous regrowth or maximizing the yield potential growth stage period. In order to achieve the benefits of foliar feeding, combining proper methods of application and the best suited nutrient materials related to specific crops is essential.

Materials and Methods

A field trial was conducted at the Experimental Farm, Sevathur Village, Tirupattur Taluk, Vellore District, Tamil Nadu. The experiment was laid out in Randomized Block Design (RBD) and resultant seed quality was laid out in Completely Randomized Design (CRD) with four replications. The plot size was $4 \times 2.5 \text{ m}^2$. The crop was raised with the spacing of $30 \times 10 \text{ cm}$ apart from the regular recommended package of practices for blackgram following

foliar spray treatments were given during flower initiation period.

Foliar spray

To get 3% concentration, 3 litre of solution was mixed with 100 litre of water and was applied using hand sprayer at 25, 35 and 45 days after sowing (DAS).

Treatment details

T₀ – Control

T₁ – *Moringa* leaf extract 3%

T₂ – *Panchagavya* 3%

T₃ – *Prosopis* leaf extract 3%

T₄ – *Neem* leaf extract 3%

Experiment was carried out to study the effect of leaf extracts and panchagavya foliar spray on plant characters, yield and resultant seed quality of blackgram. Plant characters, yield and resultant seed quality viz., plant height, days to 1st flowering, days to 50% flowering, number of leaves per plant, number of branches per plant, number of pods per plant, pod length, number of seeds per pod, seed yield per plant, seed yield per plot, 100 seed weight, germination (%), speed of germination, shoot length, root length, seedling length, dry matter production, vigour index I and vigour index II were observed and recorded. The statistical data collected and analyzed by using ANOVA.

Results and Discussion

The field trial was conducted in blackgram variety cv. CO 6 to study the effect of leaf extracts and panchagavya foliar spray on plant characters, yield and resultant seed quality and the following observations were studied and the results are discussed below. Highly significant differences were recorded among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded the maximum height (39.70 cm)

and was followed by *Moringa* leaf extract 3% (T₁) (38.70 cm) and the untreated plant (T₀) recorded the minimum plant height (31.20 cm). Application of *Panchagavya* 3% as foliar spray increased the plant height by 27.24% over the control. Increased plant height may be due to increase in protein synthesis and growth regulators such as IAA and GA₃, in *Panchagavya* may enhanced the cell division, cell multiplication and cell enlargement which favours increased inter nodal length (Sanjutha *et al.*, 2008) experienced by Natarajan (2002) in vegetables and legumes. The lower plant height was observed in control may be due to inadequate nutrient supply during the crop growth stages (Rajendran, 1991). Chemotrophs and autotropic (ammonifiers and nitrifiers) present in *Panchagavya* which colonize in the leaves increase the ammonia uptake and enhance total nitrogen supply and thereby increase the plant height and vegetative growth (Xu, 2001; Sharmila and Saravanan, 2012). The plant growth substance in *Panchagavya* helps to bring rapid changes in phenotypes of plants by enhancing cell division and elongation and also improves the growth and productivity (Yadav and Lourdraj, 2006; Kondapa *et al.*, 2009; Venkataramana *et al.*, 2009 and Tharmaraj *et al.*, 2011) and may also due to the steady supply of essential plant nutrients to crop, availability of moisture, favourable soil physical environment and the highest level of primary nutrients which prompted the auxillary buds into new shoots (Sanjutha *et al.*, 2008). Days to 1st flowering was maximum in (T₀) (32.78 days) and the minimum days to 1st flowering was recorded in the treatment (T₂) (30.52 days) when compared to the other treatments. Days to 50% flowering was maximum in (T₀) (40.23 days) and the minimum days to 50% flowering was recorded in the treatment (T₂) (36.52 days) when compared to the other treatments. The days to 1st flowering (30.52 days after sowing) and days to 50 % flowering (36.52 days after sowing) earlier in

Panchagavya sprayed plants. This may be due to supply of all micro and macronutrients and growth enzymes present in the *Panchagavya* which favoured rapid cell division and multiplication. The probable reason for early flowering in case of *Panchagavya* sprayed plants (T₂) may be due to the earlier and quicker emergence of seedlings and also due to the presence of growth promoting substances like IAA, GA₃ and cytokinin and other mineral nutrients which favours translocation of more photo-assimilates to reproductive parts thereby induces early flowering. These findings are in confirmation with Ramaswamy and Vijaykumar (2009). Highly significant differences were recorded among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded maximum number of leaves per plant (16.00) and was followed by *Moringa* leaf extract 3% (T₁) (15.00) and the untreated plant (T₀) recorded the minimum number of leaves (12.00). Highly significant differences were recorded among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded the maximum number of branches per plant (3.90) and was followed by *Moringa* leaf extract 3% (T₁) (3.10) and the untreated plant (T₀) recorded the minimum number of branches per plant (2.60). More number of leaves per plant to the tune of 33.33% increase in number of leaves per plant and 50.00% increase in number of branches per plant was recorded by T₂ over the control (T₀) which may be due to the growth enzymes present in *Panchagavya* (Patil *et al.*, 2012) and microbes which increased the availability of more nutrients, moisture and improvement of soil environment that leads to more crop growth and development. Among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded the maximum number of pods per plant (26.00) and was followed by *Moringa* leaf extract 3% (T₁) (25.00) and the untreated plant (T₀) recorded the minimum number of pods per plant (22.00). Among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded the

highest pod length (5.40 cm) and was followed by *Moringa* leaf extract 3% (T₁) (5.10 cm) and the untreated plant (T₀) recorded the lowest pod length (4.30 cm). Among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded the higher number of seeds per pod (6.00) and was followed by *Moringa* leaf extract 3% (T₁) (5.00) and the untreated plant (T₀) recorded the lower number of seeds per pod (4.00). Higher number of pods per plant and 18.18% increase in number of pods per plant recorded by T₂ over the control (T₀) which may be due to the accumulation of cytokinin and auxin in their auxiliary buds have favoured the plants to produce more number of pods per plant (Vennila and Jayanthi, 2008). The significant improvement in the accumulation of dry matter, chlorophyll content and enhancement in the biological efficiency of crop plants results in improved yield and yield attributing characters (Natarajan, 2002). Nearly 25.58% increase in pod length, and 50.00% increase in number of seeds per pod was recorded by T₂ over the control (T₀). This increase may be due to the quantities of IAA and GA₃ present in *panchagavya* when applied as foliar spray could have created stimuli in the plant system and increased the production of growth regulator in cell system and the action of growth regulators in plant system stimulated the necessary growth and development (Yadav and Lourdraj, 2006). Among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded the higher seed yield per plant (5.48 g) and was followed by *Moringa* leaf extract 3% (T₁) (5.30 g) and the untreated plant (T₀) recorded the lower seed yield per plant (4.85 g). Among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded the highest seed yield per plot (1.47 kg) and was followed by *Moringa* leaf extract 3% (T₁) (1.45 kg) and the untreated plant (T₀) recorded the lowest seed yield per plot (1.26 kg). Among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded the

highest 100 seed weight (6.10 g) and was followed by *Moringa* leaf extract 3% (T₁) (6.00 g) and the untreated plant (T₀) recorded the lowest 100 seed weight (5.00 g). Increment in 100 seed weight to the tune of 22.00% was recorded by T₂ over the control (T₀). This increase may be due to the fact that cow dung in *panchagavya* acts as a medium for the growth of beneficial microbes and provides nitrogen which is essential for crop growth and results in more seed weight (De Britto and Girija, 2006). Almost 12.99% increase in seed yield per plant and 16.67% increase in seed yield per plot was recorded by T₂ over the control (T₀). This may be due to the nutrients present in the *panchagavya* (i.e.) macronutrients like Nitrogen (N), Phosphorus (P), Potassium (K) and micronutrients which are required for the growth and development of plants. Beside this, the presence of various amino acids, vitamins, growth regulators like Auxins, Gibberellins, Cytokinin and also beneficial microorganisms like pseudomonas, azatobacter and phosphobacteria which influenced yield attributing characters like number of pods per plant, number of seeds per pod and 100 seed weight increases the field stand (Ali *et al.*, 2011). Increase in seed yield was mainly due to increase in number of seeds and 100 seed weight. This was in conformity with the findings of Kavipriya *et al.*, (2011) in greengram. Abundant supply of nutrients might have increased the protoplasmic constituents and accelerate the process of cell division and elongation. This in turn resulted in increased yield. Yield increases in (T₂) may be due to the hormonal substances present in *panchagavya* especially cytokinin which plays a role in vegetative plant parts with nutrient partitioning while in reproductive parts, high levels of nutrient mobilization. Increase in yield may also be due to fact that cow dung in *panchagavya* act as a medium for the growth of beneficial microbes and cow urine provides nitrogen which is essential for crop growth (De Britto and Girija, 2006; Patil *et al.*, 2012).

Table.1 Effect of leaf extracts and panchagavya foliar spray on plant characters of Blackgram cv. CO 6

Treatment (T)	Plant height (cm)	Days to 1 st flowering	Days to 50% flowering	Number of leaves per plant	Number of branches per plant
T ₀	31.20	32.78	40.23	12.00	2.60
T ₁	38.70	31.26	37.04	15.00	3.10
T ₂	39.70	30.52	36.52	16.00	3.90
T ₃	36.50	32.28	38.27	13.00	2.80
T ₄	37.50	31.27	37.06	14.00	2.90
Mean	36.72	31.62	37.82	14.00	3.06
SEd	0.2291	0.2772	0.1818	0.2580	0.0258
CD (P=05)	0.5292	0.6402	0.4199	0.5959	0.0596

Table.2 Effect of leaf extracts and panchagavya foliar spray on yield of blackgram cv. CO 6

Treatment (T)	Number of pods per plant	Pod length (cm)	Number of seeds per pod	Seed yield per plant (g)	Seed yield per plot (kg)	100 seed weight (g)
T ₀	22.00	4.30	4.00	4.85	1.26	5.00
T ₁	25.00	5.10	5.00	5.30	1.45	6.00
T ₂	26.00	5.40	6.00	5.48	1.47	6.10
T ₃	23.00	4.70	4.00	4.98	1.36	5.20
T ₄	24.00	4.90	5.00	5.32	1.38	5.50
Mean	24.00	4.88	4.80	5.18	1.38	5.56
SEd	0.1842	0.0491	0.2456	0.0573	0.0045	0.0167
CD (P=05)	0.4254	0.1135	0.5674	0.1323	0.0103	0.0387

Table.3 Effect of leaf extracts and panchagavya foliar spray on resultant seedling characters of blackgram cv. CO 6

Treatment (T)	Germination (%)	Speed of germination	Shoot length (cm)	Root length (cm)
T ₀	87.00 (68.86)	20.30	16.50	15.60
T ₁	92.00 (73.57)	24.00	18.70	16.20
T ₂	93.00 (74.66)	26.50	19.50	17.30
T ₃	90.00 (71.56)	22.00	17.30	16.40
T ₄	91.00 (72.54)	23.50	18.40	17.20
Mean	90.60 (72.24)	23.26	18.08	16.54
SEd	0.1923 (0.1835)	0.5022	0.2202	0.1343
CD (P=05)	0.4287 (0.4093)	1.1200	0.4909	0.1899

(Figures in parenthesis indicate arcsine transformed value)

Table.4 Effect of leaf extracts and panchagavya foliar spray on resultant seedling length (cm), dry matter production (g seedling⁻¹⁰), vigour index I and vigour index II of blackgram cv. CO 6

Treatment (T)	Seedling length (cm)	Dry matter production (g seedling ⁻¹⁰)	Vigour index I	Vigour index II
T ₀	32.10	0.1160	2792.70	10.09
T ₁	34.90	0.1250	3210.80	11.50
T ₂	36.80	0.1320	3422.40	12.27
T ₃	33.70	0.1170	3033.00	10.53
T ₄	35.60	0.1220	3239.70	11.10
Mean	34.62	0.1224	3139.70	11.10
SEd	0.7065	0.0012	9.4866	0.1669
CD (P=05)	1.5755	0.0026	21.1551	0.3723

Fig.1 Effect of leaf extracts and panchagavya foliar spray on number of pods per plant and number of seeds per pod of blackgram cv. CO 6

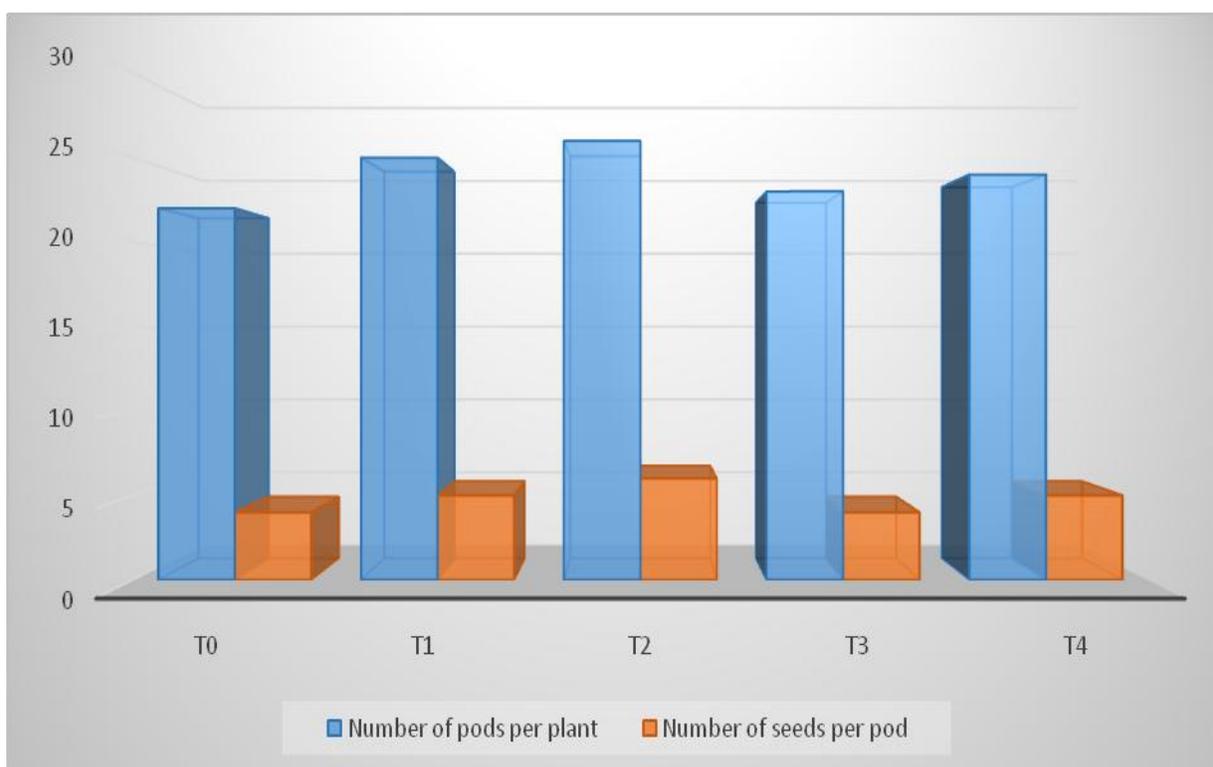


Fig.2 Effect of leaf extracts and panchagavya foliar spray on seed yield per plant and 100 seed weight of blackgram cv. CO 6

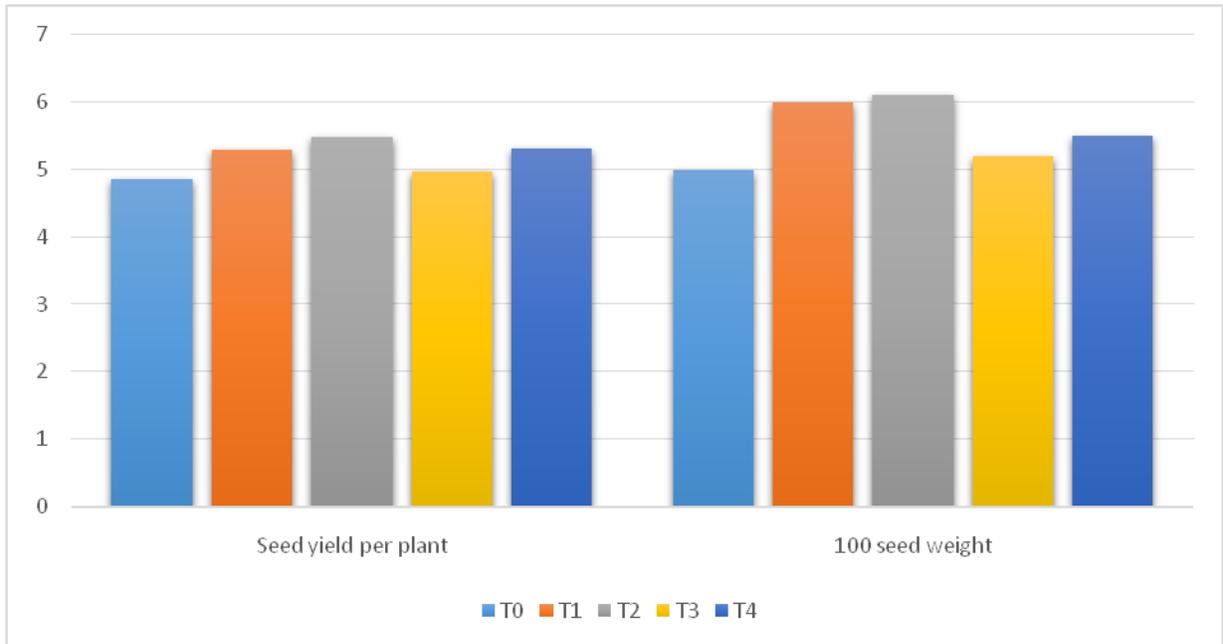
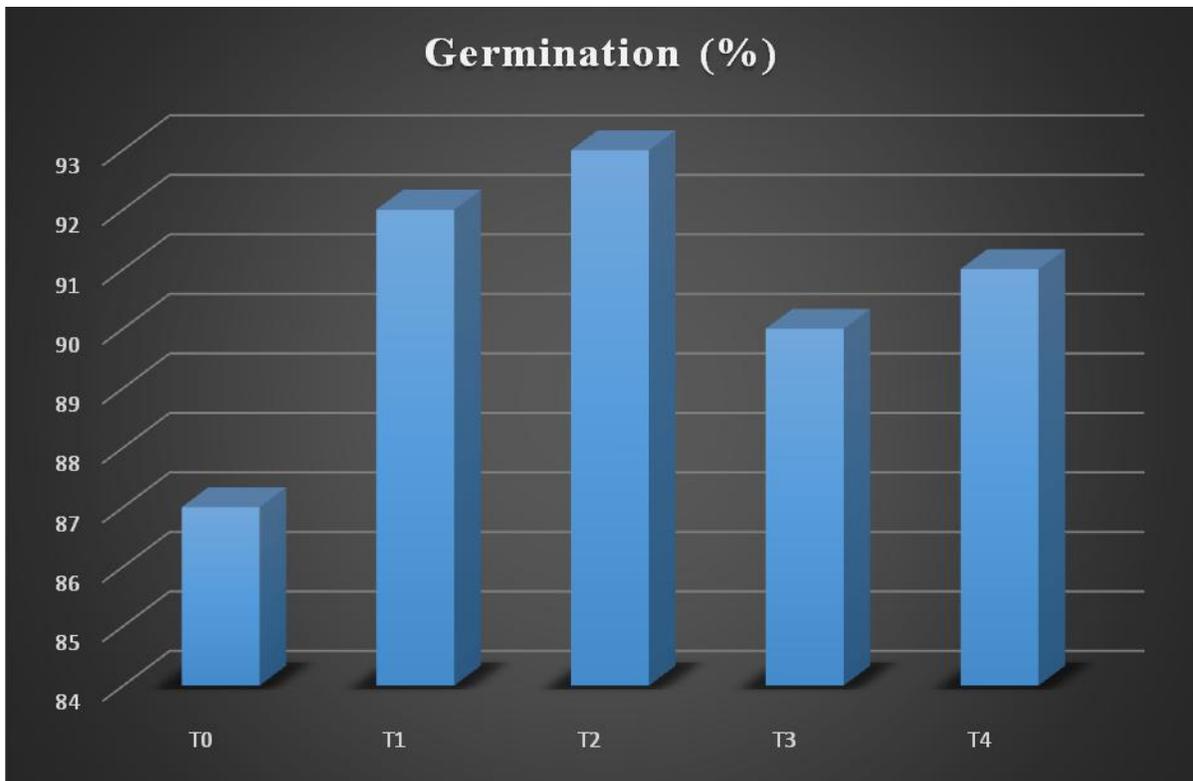


Fig.3 Effect of leaf extracts and panchagavya foliar spray on germination (%) of resultant seed of blackgram cv. CO 6



This was in conformity with the works of (Somasundaram *et al.*, 2007; Tharmaraj *et al.*, 2011; Ravikumar *et al.*, 2012; Yadav Prakash and Tripathi, 2013). The least yield in control might be due to the lack of adequate supply of phosphate and nitrogen to the crop which in turn affected the growth and yield components of the crop (reduction in source and sink) ultimately reflecting on yield. Similar results were reported by (Pandian *et al.*, 2001; Kumar *et al.*, 2011). Among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded the highest germination percentage (93.00 %) and was followed by *Moringa* leaf extract 3% (T₁) (92.00 %) and seeds from the untreated plant (T₀) recorded the lowest germination percentage (87.00 %). Among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded the maximum speed of germination (26.50) and was followed by *Moringa* leaf extract 3% (T₁) (24.00) and seeds from the untreated plant (T₀) recorded the slowest speed of germination (20.30). Among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded the highest shoot length (19.50 cm) and was followed by *Moringa* leaf extract 3% (T₁) (18.70 cm) and seeds from the untreated plant (T₀) recorded the lowest shoot length (16.50 cm). Among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded the highest root length (17.30 cm) and was followed by *Moringa* leaf extract 3% (T₁) (16.20 cm) and seeds from the untreated plant (T₀) recorded the lowest root length (15.60 cm). Among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded the highest seedling length (36.80 cm) and was followed by *Moringa* leaf extract 3% (T₁) (34.90 cm) and seeds from the untreated plant (T₀) recorded the lowest seedling length (32.10 cm). Among the foliar spray treatments, *Panchagavya* 3% (T₂) recorded the highest dry matter production (0.1320 g) and was followed by *Moringa* leaf extract 3% (T₁) (0.1250 g) and seeds from the untreated plant (T₀) recorded the lowest dry matter

production (0.1160 g). Maximum vigour index I values was recorded by foliar spray with *Panchagavya* 3% (T₂) (3422.40) and was followed by *Moringa* leaf extract 3% (T₁) (3210.80) and seeds from the untreated plant (T₀) recorded the minimum number of vigour index I (2792.70). Maximum vigour index II values was recorded by foliar spray with *Panchagavya* 3% (T₂) (12.27) and was followed by *Moringa* leaf extract 3% (T₁) (11.50) and seeds from the untreated plant (T₀) recorded the minimum number of vigour index II (10.09). In the present foliar spray, *panchagavya* 3% (T₂) applied plants recorded higher values for resultant seed qualities viz., germination percentage (93.00%), speed of germination (26.50), root length (17.30cm), shoot length (19.50cm), seedling length (36.80cm), dry matter production (0.1320g seedling⁻¹⁰), vigour index I (3422.40) and vigour index II (12.27) and control (T₀) recorded the lower values. This increase was due to supply of all micro and macronutrients present in the *panchagavya* and also by the growth enzymes present in *panchagavya* favoured rapid cell division and multiplication as reported by Ramaswamy and Vijaykumar (2009). Improved nutrition may enable greater leaf area production that results in greater interception of light thereby increasing dry matter production (source to sink) (Kumawat *et al.*, 2009). The significant improvement and distribution of dry matter production in different parts was attributed to increased supply of plant nutrients, chlorophyll synthesis, nitrogen metabolism and phyto hormones with the foliar spray of *panchagavya* (Figs. 1–3; Table 1–4).

The present study on effect of leaf extracts and *panchagavya* foliar spray on plant characters, yield and resultant seed quality of blackgram concludes that the foliar spray of *panchagavya* 3% increases the plant characters, yield attributes and resultant seed qualities. This increase was due to the

presence of plant growth substance, growth enzymes, cow dung in *panchagavya* acts as a medium for the growth of beneficial microbes, nutrients present in *panchagavya* and presence of various amino acids, vitamins and growth regulators. Hence foliar spray of *panchagavya* 3% which suits for increasing the plant characters, yield and resultant seed qualities of blackgram.

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