The Pharma Innovation Journal 2023; 12(4): 2729-2732

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(4): 2729-2732

www.thepharmajournal.com
Received: 17-03-2023
Accepted: 28-04-2023

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In vivo seed vigor estimates of Blackgram (*Vigna mungo* L.) as influenced by leaf Laechates of different *Pongamia pinnata* (L.) Pierre provenances

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Abstract
This experiment was undertaken to elucidate the allelopathic effect of ten different *Pongamia pinnata* (L) Pierre provenances on germination blackgram. The study carried out at seed testing laboratory, Main Agricultural Research station, University of agricultural sciences, Dharwad, India, during 2019 and 2020. The leaf litter (mixture of young and mature leaves) of *Pongamia pinnata* (L) Pierre were collected in both the years 2019 1nd 2020 from 5 years old plantation during October – November and the extract was prepared. The leaf extract was sprayed to the germination sheet so that it should come in contact with all 100 seeds in the germination sheet. The pooled result of both years is depicted. Results were.

Keywords: Vigor estimates, Pierre provenances, *Vigna mungo* L.

Introduction
Allelopathy is the negative effect of chemicals released by one plant species on the growth and reproduction of another (Akacha, *et al*., 2013) [1]. Allelopathy can affect many aspects of plant ecology, including occurrence, growth, and plant succession, the structure of plant communities, dominance, diversity, and plant productivity. These effects can be either positive or negative. There are four main classes of chemical interactions, antibiotics (microorganisms to microorganism), Kolines (plants to plants), marasmins (microorganisms to plants), and phytoncides (plants to microorganisms). In allelopathic terms, a chemical is "conveyed" to a "receiver" which can either be "impaired" or "assisted" (Al-Khatib *et al.* 1997) [3]. Interaction between soil organisms and plants is important in allelopathy. The activity of nitrogen fixing bacteria could be affected by allelopathy.

Pongamia pinnata L. (Known as kerung) belongs to family Fabaceae which is medium size, an evergreen tree having short trunk and dispersing crown. The trees are planted for shade purposes and grown as an ornamental tree. It is also a nitrogen fixing tree which produces seeds containing 30-40% oil. It is a high-speed growing; deciduous, glabrous, trunk of diameter up to 60 cm, bark is smooth, grey in colour. Its leaves are imparipinnate, sometimes shiny, young, pinkish red, glossy and deep green when mature. Its many parts are used for timber, fuel production, medicinal and industrial purposes (Alam *et al.,* 2004) [2]. Pests are harmful to agriculture, forestry and public health which are causing losses in millions of dollars. Numerous approaches are used for the crop management against these pests. Physical, chemical, biological and resistance breeding are the most common. In chemical approach, pesticides are used with an extensive range and controlling numerous pests activities. Increasing awareness of public concern regarding a continued use of agro-chemicals that are damaging biotic and abiotic environment, driving the search of more environmentally safe methods that will contribute to the goal of sustainability in agriculture (Harman *et al.,* 2004) [5]. Black gram originated in South Asia, where it has been in cultivation from ancient times and is one of the most highly prized pulses of India. It is very widely used in Indian cuisine. In India the Black gram is one of the important pulses grown in both Kharif and Rabi seasons. This crop is extensively grown in Nagapattinam, Thiruvarur, Cuddalore, Thoothukudi, Tirunelveli, and Villupuram districts of Tamilnadu. The Coastal Andhra region in Andhra Pradesh is known for black gram. The Guntur District ranks first in Andhra Pradesh for the production of black gram. In Nepal it is known as Kalo Maas Daal or Kalo Daal (black legume) and it is a very popular *daal* (legume) side dish that goes with curry and rice as a platter.

Black gram has also been introduced to other tropical areas such as the Caribbean, Fiji, Mauritius, Myanmar and Africa, mainly by Indian immigrants during the Indian indenture system.

Efferts were made to know the effect of leaf leachates of pongamia and the allelochemicals influence on the seed germination, root length, shoot length, total seedling length, dry weigth of seedling and other related factors like germination per cent, seed vigour index and mobilization efficiency.

Methodology

The present investigations were accomplished in seed testing laboratory, Main Agricultural Research station, University of agricultural sciences, Dharwad, India, at 15° 26' North latitude and 75° 0' East longitude, with an elevation (altitude) of 678 m above mean sea level during December, 2020.

The leaf litter (mixture of young and mature leaves) of *Pongamia pinnata* (L) Pierre were collected from 5 years old plantation during October – November 2020. Leaf litter was initially dried at room temperature and later at 65 °C in hot air oven until constant dry weight was reached (Perez Corona *et al*., 2013) [8]. The dried leaf litter was stored at room temperature and was used for experiment. Aqueous extracts were prepared by soaking 200g of grounded dried leaf litter in 1L distilled water. The solution was stirred and kept at room temperature (20-25 °C) for 24 hours. The filtrate was centrifuged and supernatant was decanted (Prasad *et al*., 2011) [9].

Seeds of blackgram (DU-1) variety were collected from seed unit UAS. Dharwad. Germination sheets were thoroughly washed in distilled water and 100 seeds of blackgram were placed at equal spacing in the germination sheet and 50 ml of leaf extract is treated uniformly so that all seeds should come in contact with leaf extract. Germination seeds were properly folded and placed at germination chamber at 25 °C temperature and relative humidity 90% for 8 days. The seed was considered germinated when the radical emerges.

Results and Discussion

Effect of leaf leachates (Table no.1) explained both stimulatory and inhibitory influence on all the characters. Pooled data for the year 2019 and 2020 indicates that there was significant difference among the treatments were observed. Pooled data on maximum root length was observed in control (T11) 16.2cm followed by (T7) (RAK-8) 15.4 cm and lowest root length was observed in (T1) (RAK-1) 14.2cm. similarly shoot length indicates maximum shoot length is recorded in control (T11) 18.0, followed by (T7) (RAK-8) and (T8) (RAK-9) 16.4cm, lowest shoot length is recorded in (T1) (RAK-1) 14.7 cm. Total seedling length (cms) was recorded maximum in (T11)(34.2 cm) followed by (T7) (RAK-8) 31.6, (T2) (RAK-2) 31.5 and (T3) (RAK-3), (T4) (RAK-4)and (T5) (RAK-6) are on par with each other. Lowest total seedling length was recorded in (T1) (RAK-1) 28.7 cm. Pooled data on dry weight of seedlings was recorded which indicates there was significant differences between treatments. The highest dry weight of seedling was recorded in control (T11) (0.330 gm) followed by (T7) (RAK-8) 0.299, (T3) (RAK-2) 0.297 gm. (T2) (RAK-3) 0.295 and lowest dry weight of seedling recorded is (T1) (RAK-1)0.249 gms.

The germination (Table No.2.) per cent was highest in conrtol (T11) 98.67% and was lowest in (T8) (RAK-9) 96.00%. Where as the seedling vigour index and mobilization efficiency (%) was maximum in control (T11) 3376.4 and 57.7 respectively and lowest in (T1) (RAK-1) 2845.9 and 42.7% respectively.

Thakur *et al.* (2017) [11], reported that the leaf aqueous extract of *Melia dubia* under laboratory and leaf litter in pot culture, exhibited significant (p<0.05) inhibitory effect on growth parameters root length of germinated seedling of green gram and black chickpea. The data indicates that, growth parameters had gradual inhibitory effect as the extract concentration or litter quantity increased when compared with the control treatment. Further reported that despite validation of allelochemicals in *M. dubia* through GC-MS analysis, the leaf mulch treatments did not exhibit inhibitory or stimulatory effect on later stage of growth of green gram and black chickpea in the present study.

Oraon and Mondal (2019) [1] reported that *Putranjiva roxburghii* leaf extracts showed differential influence on the seed germination and early growth of the chickpea. The germination percentage decreased significantly to 95, 90.66, 88, 74.33, 62, 54.66, 44% at 5, 10, 15, 25, 35, 50, 75% aqueous leaf extracts respectively, while 24% seed germination was observed in 100% of aqueous leaf extracts whereas in control treatment, it showed 100% of germination. De Souza *et al.*, 2019, reported that *Cyperus rotundus* presents allelopathic effects on the germination of tomato and cabbage seeds. As then concentration of the tuber extract increases, the inhibitory effect increases, thus reducing germination and seed vigor in the different types of substrates. Despite the reports on the allelopathic effects of mimosine, not much information on the mode of action is available. Rizvi and Rizvi, 1987, have found that mimosine inhibited a large number of physiological and biochemical parameters in *V. mungo* and *P. aureus.* They found that mimosine inhibited seedling vigor, food mobilization efficiency, solubilization of starch, breakdown of proteins, and activity of amylase. Latha *et al*. (2001) reported the leachates of *Pongamia pinnata* contained allelochemicals such as vanillic acid, syringic acid, melilotic acid and-derivatives of quercetin and kaempferol have effect on various seedling characters of pulses including blackgram.

Table 1: Influence of leaf extract of *Pongamia pinnata* provenances on root length (cms) and shoot length (cms.) in blackgram

Treatments	Root length (cms)			Shoot length (cms)		
	2019	2020	Pooled	2019	2020	Pooled
T_1-RAK-1	13.8	14.6	14.2	14.7	14.5	14.7
T_2-RAK-2	15.1	16.2	15.2	16.4	15.4	16.3
T_3-RAK-3	15.1	16.5	15.2	16.2	15.4	16.3
T_4-RAK-4	14.9	16.3	14.9	16.3	15.0	16.3
T_5-RAK-6	14.9	16.2	14.9	16.4	14.8	16.3
T_6-RAK-7	14.9	16.4	15.0	16.2	15.0	16.3
T_7-RAK-8	15.3	16.6	15.4	16.4	15.5	16.4
T_8-RAK-9	15.1	16.4	15.1	16.3	15.1	16.4
T_9-RAK-10	14.0	15.8	14.3	15.9	14.6	15.8
T_{10}-DPS-1	15.3	14.8	15.3	14.8	15.3	14.8
T_{11}-Control	16.2	18.0	16.2	17.9	16.2	18.0
S.Em (±)	0.2	0.4	0.3	0.4	0.3	0.4
C. D. (5%)	0.8	1.3	0.8	1.4	0.9	1.3

Table 2: Influence of leaf extract of *Pongamia pinnata* provenances on Total seedling length (cm) and dry weight of seedlings (gms) in blackgram

Treatments	Total seedling length (cm)			Dry weight of seedlings (gms)		
	2019	2020	Pooled	2019	2020	Pooled
T_1-RAK-1	28.8	29.2	28.7	0.249	0.240	0.244
T_2-RAK-2	31.5	30.9	31.5	0.297	0.293	0.295
T_3-RAK-3	31.3	31.5	31.3	0.297	0.297	0.297
T_4-RAK-4	31.2	30.8	31.2	0.287	0.280	0.283
T_5-RAK-6	31.3	30.8	31.3	0.293	0.293	0.293
T_6-RAK-7	31.1	31.1	31.1	0.296	0.296	0.296
T_7-RAK-8	31.6	31.9	31.6	0.297	0.298	0.299
T_8-RAK-9	31.4	31.8	31.4	0.294	0.294	0.294
T_9-RAK-10	29.7	30.5	29.7	0.253	0.253	0.253
T_{10}-DPS-1	30.1	29.8	30.1	0.292	0.295	0.293
T_{11}-Control	34.2	34.5	34.2	0.327	0.333	0.330
S.Em (±)	0.5	0.5	0.5	0.008	0.001	0.001
C. D. (5%)	1.6	1.3	1.6	0.023	0.03	0.02

Table 3: Influence of leaf extract of *Pongamia pinnata* provenances on seed germination per cent (%), seedling vigour index and mobilization efficiency (%) in blackgram

Treatments	Seed germination (%)			Seedling vigour index (%)			Mobilization efficiency (%)		
	2019	2020	Pooled	2019	2020	Pooled	2019	2020	Pooled
T_1-RAK-1	98.00	98.00	98.00	2875.9	2815.9	2845.9	43.5	42.0	42.7
T_2-RAK-2	97.67	97.33	97.17	3071.7	3019.2	3045.5	52.0	51.3	51.6
T_3-RAK-3	97.00	97.00	96.67	3033.7	3012.3	3023.0	51.9	51.9	51.9
T_4-RAK-4	96.67	96.67	96.50	3010.9	3000.0	3005.4	50.1	49.0	49.5
T_5-RAK-6	97.33	97.33	97.00	3045.1	3024.5	3034.8	51.3	51.3	51.3
T_6-RAK-7	97.00	97.00	96.67	3016.9	3006.4	3011.7	51.7	51.7	51.7
T_7-RAK-8	97.00	96.67	96.50	3072.6	3044.7	3055.1	53.2	52.2	52.2
T_8-RAK-9	96.00	96.00	96.00	3014.4	3014.4	3014.4	51.5	51.5	51.5
T_9-RAK-10	96.67	96.67	96.67	2870.4	2870.4	2870.4	44.2	44.2	44.2
T_{10}-DPS-1	98.00	98.00	98.00	2946.5	2946.5	2946.5	51.0	51.6	51.3
T_{11}-Control	98.67	98.67	98.67	3369.9	3382.9	3376.4	57.1	58.3	57.7
S.Em (±)	0.62	0.55	0.59	58.12	54.24	55.9	1.38	1.46	1.39
C. D. (5%)	1.81	1.61	1.74	170.5	159.1	164.9	4.1	4.3	4.1

Conclusion

The present study also threw limelight on the effective use of this tree, wherein planting this tree amidst pulse related herb plantations could affect the growth of the economically viable plants, but this tree can very well adapt to diversified soil conditions and rainfall zones. This present study revealed that allelochemicals relessed from the leaf extract affected the seedling root length, shoot length, total seedling length, seedling dry weight, germination per cent, seedling vigour and mobilization efficiency also. Root length was recorded highest in control (T11) only water and least was recorded in (T1) RAK-1+blackgram followed by in (T10) and (T7). where as in case of shoot length the treatments (T11) control recorded highest value and (T1) RAK-1+blackgram followed by (T2), (T5) and (T7) respectively. Total seedling length also followed same trend. Both the years (2019 and 2020) and pooled data (T11)-control has recorded maximum seed germination (%) and least seed germination (%) was recorded in (T8) RAK-9+blackgram. Seedling vigour and mobilization efficiency also followed similar trend.

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