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Effect of sowing date and weed management techniques on yield attributes and yield of blackgram (*Vigna mungo* L.)

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Abstract
A field experiment was conducted on effect of sowing date and weed management techniques on yield attributes and yield of blackgram (*Vigna mungo* L.) during *Kharif* -2016 at Raj Mohini Devi College of Agriculture and Research Station, Ajirma, Ambikapur (C.G.). The treatment comprises three date of sowing (S1- 15th July, S2- 25 July and 05th August) and four weed management techniques (W1- Control plot, W2- mechanical weeding at 15 and 30 DAS and removal of weeds within row by hand, W3- Pendimethalin @ 0.75 liter a. i. ha^{-1} at 0-2 DAS + mechanical weeding at 30 DAS W4- Pendimethalin @ 0.75 liter a. i. ha^{-1} at pre-emergence + sodium acifluorfen (16.5%) + clodinafop- propagyl (8%) EC @ 0.245 liter a. i. ha^{-1} at 20-25 DAS) respectively laid out in split plot design with three replications (Main plot consists – date of sowing and sub plot – weed management techniques). The result reveled that treatment combination of first date of sowing (S1) with application of two mechanical weeding (W_2) at 15 and 30 DAS is more yield attributes and yield production followed by date of sowing 15th July with application of pendimethalin @ 0.75 liter. a.i. ha^{-1} at 0-2 DAS + mechanical weeding at 30 DAS. It was due to higher number of pods $plant^{-1}$, pod length (cm), number of seeds $pods^{-1}$, pod weight $plant^{-1}$(g), 100 seed weight (g), seed yield (q ha^{-1}), stover yield (q ha^{-1}), biological yield (q ha^{-1}).

Keywords: Blackgram, date of sowing, weed management, yield attributes

Introduction
Blackgram (*Vigna mungo* L.) also known as urdnean, belong to family leguminoseae is one of the important pulse crop grown in many Asian countries including India, where the diet is mostly cereal based. Blackgram are rich source of protein (17 to 25 %) as compared to cereals (6 to 10 %) and, their ability to fix atmospheric nitrogen and improve the soil fertility status. Among the pulses, blackgram is extensively cultivated pulse crop. It has originated from Indian sub-continent (De candoll, 1986) [1]. its seed contain 55-60% carbohydrate, 22-24% protein and 1.0-1.3% of fat besides, phosphoric acid(H_3PO_4), being 5-10 times more than other pulses. Blackgram, especially contains a higher percentage of methionine compared to other food legume. Its dry stalks along with the pod husk forms a nutritive fodder especially for cattle. In India, Blackgarm is grown in 3.06 million ha area with total production of 1.70millions tones and productivity 5.55 qt.ha^{-1} whereas Chhattisgarh it occupies 0.10 million ha area with total production of 0.03 million tones and productivity 3.04 qt.ha^{-1}.

The weather parameters play an important role in deciding the success or failure of the crop, because they strongly influence strongly the physiological expression and genetic potential of the crop. It is well known that yield from any given crop or variety depends on the availability of certain optimum rainfall, solar radiation, temperature, soil moisture, heat units etc. during different stages of crop growth. Among different management factors, sowing time plays a key role in obtaining higher yield. Time of sowing is known to influence the yield and growth of black gram. The optimum time is mainly dependent on prevailing agro-climatic conditions of an area besides the crop grown. Planting during the optimum period, therefore, ensures better harmony between the plant and weather which ultimately results in higher crop yields (Venkateshwarulu and Sounda Rajan, 1991) [6].

Sowing date has the greatest effects on the grain yield of blackgram. Delay in sowing beyond optimum date results in a progressive reduction in the potential yield of the crop. Sowing time is considered as one of the important productivity limiting factors that affect the plant growth and ultimately crop yield. Time of sowing determines time of flowering and it has great influence on dry matter accumulation, seed set and seed yield.

Sowing time affects plant physiological and morphological specifications like effect on vegetative and reproductive periods, harvest time, yield and its quality. To achieve good yield, crop must be sown at appropriate time. Sowing times has makeable effects on growth and yield of most crops in different parts of the world as delay in sowing beyond the optimum time usually results in yield reduction (Vange and Obi, 2006) [5].

The productivity of blackgram is very low in India as well as in Chhattisgarh due to various agronomic reasons, among them weed infestation is one of the major limiting factors in production, especially during rainy *(kharif)* season. Uncontrolled weeds at critical period of crop-weed competition caused a reduction of 80-90% in yield depending upon type and intensity of weed infestation. Weed species infesting blackgram vary according to the agro-ecosystem of the growing region. *Ageratum conyzoids, Boreria hispida, Commelina banghalensis* and grasses like *Echinochloa colona, Cynodon dactylon, Paspalum scrobiculatum, Digiteria sanguinalis* and sedges like *Cyperus rotundus* are the major weeds in mashbean. Most prominent weeds species observed in blackgram fields are *Panicum colona* L., *Cynodon dactylon* L., *Cyperus rotundus* L., *Digera arvensis* Forsk, *Euphorbia hirta* L., *Leucas aspera* Spreng., *Phyllanthus niruri* L., *Portulaca oleracea* L., *Indigoflora glandulosa* L., *Phyllanthus niruri* L.

Materials and Methods

The experiment was conducted at farm of RMD College of Agriculture and Research Station, Ambikapur (C.G.) during kharif season 2016, which is located at latitude of $23^0 8'$ N, longitude of $83^0 15'$E and an altitude of 623 m mean sea level. The treatment consist of three date of sowing (15th July 2016, 25th July 2016 and 5th August 2016) as main plot and four weed management techniques (W_1: Control (weedy check), W_2: Mechanical weeding at 15 and 30 DAS and removal of weeds within rows by hand, W_3: Pendimethalin @ 0.75 lit. a. i. ha^{-1} at 0-2 DAS + Mechanical weeding at 30 DAS, W_4: Pendimethalin @ 0.75 lit. a. i. ha^{-1} at pre-emergence + Sodium acifluorfen (16.5%) + clodinafop - propargyl (8 %) EC @ 0.245 lit. a. i. ha^{-1} at 20- 25 DAS) as sub plots which were laid out in split plot design. Indira urd-1 variety was sown in 30cm X 10cm (row to row and plant to plant). Data were recorded on number of pods plant^{-1}, pod length (cm), number of seeds pods^{-1}, pod weight plant^{-1}(g), 100 seed weight (g), seed yield (q ha^{-1}), stover yield (q ha^{-1}), biological yield (q ha^{-1}) were recorded by following the standard procedures.

Result and Discussion

Effect of date of sowing on yield attributes and yield

The mean number of pod plant^{-1}, pods length (cm) and pods weight plant^{-1} was significantly influenced by the various treatments. The sowing of July 15th was recorded significantly higher number of pods plant^{-1} (36.93), pods length (4.71cm) and pods weight plant^{-1}(16.46g) as compared to other sowing times. The sowing of July 15th was recorded significantly higher number of seed pod^{-1} (7.73) than other sowing times which was at par with sowing time July 26th (7.43 & 6.78). The sowing times has non-significant effect on test weight (100 seeds wt.). Higher yield attributes observed in first sowing time thus, due to the favorable climatic conditions to crop growth and minimum attack of pest and diseases. The data showed that the sowing time July 15th recorded significantly higher mean seed yield (10.68 q ha^{-1}) over rest of the sowing times but at par with the July 25th (8.93 q ha^{-1}) followed by August 5th (6.37 q ha^{-1}). The sowing time July 15th recorded higher mean stover yield (20.77 q ha^{-1}) which was significantly superior over rest of the treatments *i.e.* 25th July (17.89 q ha^{-1}) and 5th August (13.53 q ha^{-1}). The sowing time July 15th recorded higher mean biological yield (31.45q ha^{-1}) which was significantly superior over rest of the treatments followed by sowing time July 25th and August 5th. A delay in sowing time results in yield loss. This yield loss was more a result of reduction in the number of pods plant^{-1}. Significantly highest Harvest index was recorded with the sowing dates July 15th (33.87%) compare to other date of sowing. This may be due to a shortened growth period and cloudy weather as planting time was delayed. Lower yield could also have been due to the attack of blister beetle contributed to the reduction of flowers and consequently number of pods. Similar trend were observed in seed, straw and biological yield of green gram by Taleei *et al.,* (1999) [4].

Effect of weed management techniques on yield attributes and yield

Among the various weed management methods, yield attributes *viz.,* number of pods plant^{-1}(32.18), pods length (4.69 cm), number of seed pod^{-1}(7.6), pods weight plant^{-1}(14.72g) and 1000 seed weight (43.14 g) were significantly increased application of mechanical weeding at 15 and 30 DAS and removal of weeds within rows by hand which was meticulously comparable with pendimethalin @ 0.75 lit. a. i. ha^{-1} at 0-2 DAS + Mechanical weeding at 30 DAS and pendimethalin @ 0.75 lit. a. i. ha^{-1} at pre-emergence + Sodium acifluorfen (16.5%) + clodinafop-propargyl (8 %) EC @ 0.245 lit. a. i. ha^{-1} at 20- 25 DAS. The above promising weed management practices were responsible for not only the reduction of weed growth but also to reduce the nutrient depletion by weeds and thereby increasing the nutrient uptake by crop throughout its life period. This type of congenial atmosphere created by the promising weed management practices helped the crop to obtain more number of pods plant^{-1}, seeds plant^{-1} of blackgram. The results are analogous to those reported by Rao, (2011) [3].

The maximum seed yield 10.25 q ha^{-1} were registered with the application of mechanical weeding at 15 and 30 DAS and removal of weeds within rows by hand which was meticulously comparable with pendimethalin @ 0.75 lit. a. i. ha^{-1} at 0-2 DAS + Mechanical weeding at 30 DAS and pendimethalin @ 0.75 lit. a. i. ha^{-1} at pre-emergence + Sodium acifluorfen (16.5%) + clodinafop-propargyl (8 %) EC @ 0.245 lit. a. i. ha^{-1} at 20- 25 DAS (9.27 and 8.89 q ha^{-1}). This might be due to better control of all categories of weeds. In addition to that a uniform required plant population per unit area and increased number of leaves resulted in higher photosynthesis assimilation rates in metabolic activity and cell division which consequently increased the growth characters and yield attributes was maintained due to application of pre and post emergence herbicides. This resulted in lower nutrient depletion and lesser dry weight of weeds and thereby increasing the nutrient uptake of crop growth and yield attributes and seed yield of irrigated balckgram. These were in accordance with the earlier findings of Hemraj *et al*. (2009) [2].

Table 1: Effect of date of sowing and weed management techniques on yield attributes of blackgram

Treatment	No of pods plant^{-1}	Pods length (cm)	No of seeds pod^{-1}	Pods weight plant^{-1}(g)	100 seed weight(g)	Seed yield (q ha^{-1})	Stover yield (q ha^{-1})	Biological yield (q ha^{-1})
Date of sowing								
S_1: 15 July, 2016	36.93	4.71	7.73	16.46	43.85	10.68	20.77	31.45
S_2:25 July, 2016	28.24	4.55	7.43	11.04	42.60	8.93	17.89	26.82
S_3: 05 Aug., 2016	19.77	4.41	6.78	6.80	40.56	6.37	13.53	19.90
SEm±	0.66	0.04	0.16	0.35	0.58	0.33	0.75	0.70
CD(P=0.05)	2.59	0.18	0.66	1.38	2.30	1.31	2.98	2.77
Weed management								
W_1	21.68	4.35	6.75	8.93	40.80	6.23	15.90	22.13
W_2	32.18	4.69	7.60	14.72	43.14	10.25	18.76	29.02
W_3	30.60	4.63	7.51	12.20	42.72	9.27	17.48	26.75
W_4	28.80	4.54	7.40	9.88	42.68	8.89	17.43	26.33
SEm±	0.73	0.07	0.16	0.44	0.65	0.33	0.66	0.77
CD(P=0.05)	2.18	0.20	0.47	1.33	1.95	0.97	1.96	2.28

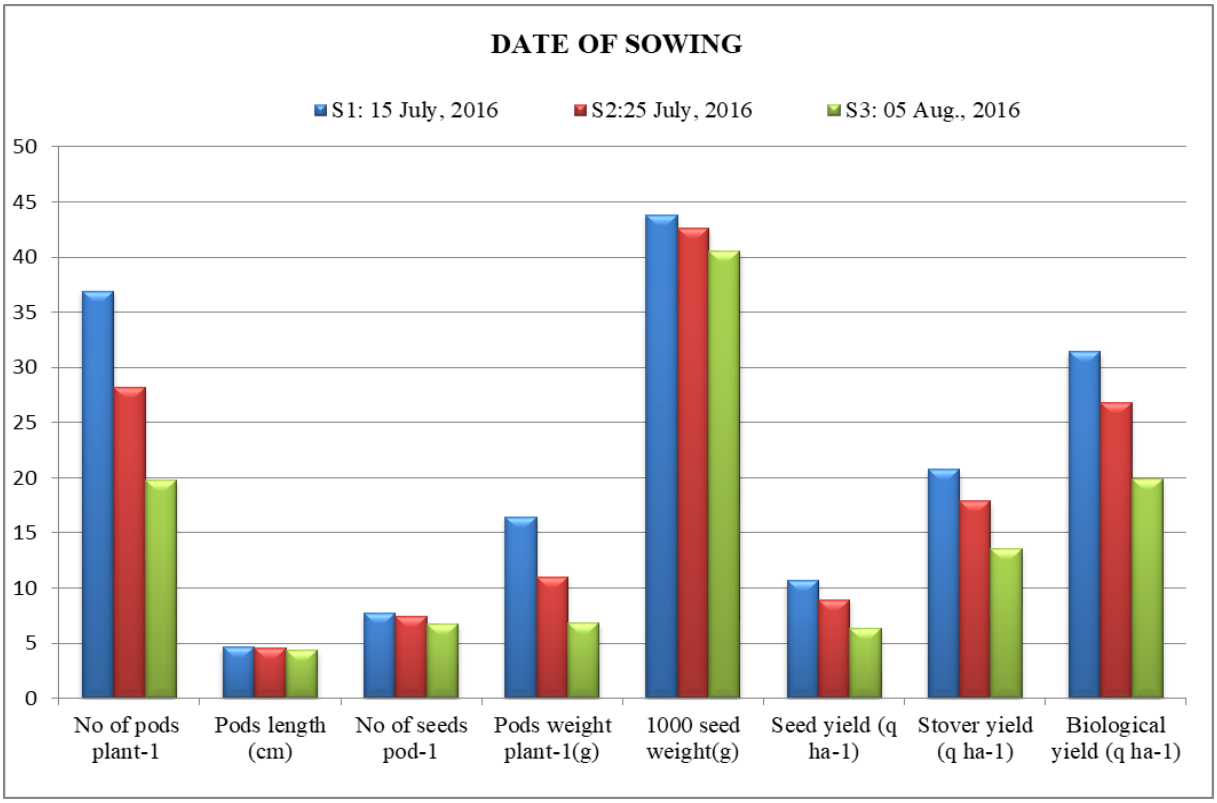

Fig 1: Effect of date of sowing on yield attributes and yield

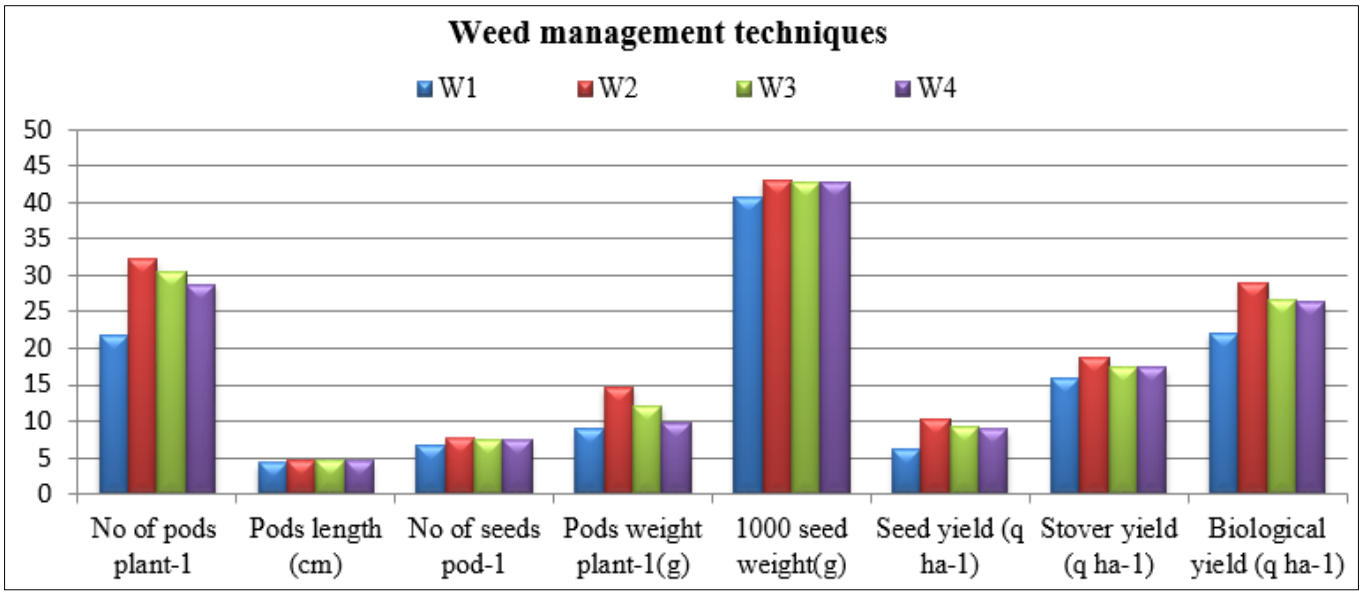

Fig 2: Effect of weed management techniques on yield attributes and yield

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