

RESEARCH NOTE

Effect of stage of spray and concentration of paraquat on defoliation of green gram (*Vigna radiata* L. Wilczek)

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A field experiment was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during summer 2015 to find out optimum stage of spray and concentration of paraquat for defoliation of greengram. The experiment was laid out in Randomized Complete Block Design with factorial concept with 10 treatments consisted of two stages for spraying (65 and 70 DAS) and five levels of defoliator concentrations (1 ml, 2 ml, 3 ml, 4 ml and 5 ml). Results revealed that paraquat spray @ 5 ml l⁻¹ of water at physiological maturity (70 DAS) recorded significantly higher per cent defoliation (94.59%) and dryness of plant (96%) without impairing the germination percentage of the seed and it was on par with 4 ml l⁻¹ spray at physiological maturity (70 DAS). Paraquat spray not only encouraged defoliation but also reduced total harvest loss and brought synchronised harvesting and facilitated the mechanical harvesting.

Key words: Defoliation, Greengram, Paraquat

Greengram is the third most important pulse crop in India. There is less scope for production of greengram because of many production constraints like non availability of quality seeds of improved, short duration varieties, unscientific postharvest practice and delay in harvesting due to shortage of labours which cause shattering of pods. For timely harvesting of greengram under scarcity of labour mechanical harvesting is advisable and it requires complete defoliation of plant. Defoliation is the shedding of leaves that naturally occurs when leaves become physiologically mature. Leaf shedding (abscission) results from activity of special cells at the base of the leaf petiole where it joins the stem. This area is called the

“abscission layer.” Defoliation can be artificially achieved by the use of certain chemicals called “defoliant” or harvest aids (Thomas *et al.*, 2013). Leaf starts drying within 12 hours after defoliator application. Complete defoliation takes place, in about 3-4 days, when it applied at maturation stage. Herbicide like paraquat can be used to achieve defoliation and desiccation. There were limited studies on the effect of application of different concentrations of paraquat and stage of spray for greengram. Therefore, an attempt was made in this experiment to find out optimum concentration of paraquat and stage for application of paraquat to greengram.

A field experiment was conducted at Main Agricultural Research Station, Dharwad, during summer 2015. The experiment was laid out in Randomized Complete Block Design with factorial concept with three replications. There were 10 treatments consisted of two stages of spray (65 and 70 DAS) and five levels of defoliator concentrations (1ml, 2ml, 3ml, 4ml and 5ml). The soil was medium deep black soil with pH 7.10. The available N, P₂O₅ and K₂O contents were 240.5, 23.5 and 354.6 kg ha⁻¹, respectively. Before 15 days of sowing of the crop FYM @ 5t/ha was applied. Two seeds per hill were dibbled 5 cm deep in furrows at a spacing of 30 cm x 10 cm. Recommended dose of fertilizer (25:50:00 N:P₂O₅:K₂O kg ha⁻¹) was applied as basal at the time of sowing. The crop was harvested at its physiological maturity. The data was analysed statistically based on mean values obtained. The level of significance used in ‘F’ and ‘T’ test was P = 0.05 (Gomez and Gomez, 1984).

Results revealed that among all the treatments, application of paraquat @ 5 ml l⁻¹ brought higher defoliation per cent (94.59%) followed by 4 ml l⁻¹ at physiological maturity of 70 DAS (Table 1), which indicated the optimum time of spray and concentration of paraquat. Padmaja *et al.* (2013) reported that spraying of paraquat @ 5 ml l⁻¹ at physiological maturity caused drying and falling of mungbean leaves to 96% by first week of spraying. Three days after application of paraquat at the rate of 5 ml l⁻¹, there was drastic reduction in leaf moisture and chlorophyll content, which increased dryness per cent in leaves to greater extent (98.67%) and it was on par with 4 ml/l (Table 1)

Table 1. Dryness of plant (%) and defoliation percentage (%) of greengram as influenced by time of spray and concentration of paraquat

Concentration of paraquat	Dryness of plant (%)			Defoliation percentage (%)		
	Time of spray		Mean	Time of spray		Mean
	65 DAS	70 DAS		65 DAS	70 DAS	
1ml l ⁻¹ of water	61.33	63.33	62.33	55.00	59.50	57.25
2ml l ⁻¹ of water	70.33	74.00	72.17	61.67	66.33	64.00
3ml l ⁻¹ of water	75.67	76.67	76.17	67.00	72.50	69.75
4ml l ⁻¹ of water	96.67	98.00	97.83	93.67	93.78	93.72
5ml l ⁻¹ of water	98.67	98.67	98.67	93.66	94.59	94.43
Mean	80.53	82.13		74.32	77.34	
Sources	Concentration of paraquat	Time of spray	Interaction	Concentration of paraquat	Time of spray	Interaction
S.Em±	0.84	0.58	1.18	1.27	1.12	1.80
C.D. at 5%	2.52	NS	3.54	3.81	NS	5.4

Table 2. Germination per cent (%) of greengram as influenced by time of spray and concentration of paraquat

Concentration of paraquat	Germination per cent at one day after harvest			Germination per cent at 15 days after harvest		
	Time of spray		Mean	Time of spray		Mean
	65 DAS	70 DAS		65 DAS	70 DAS	
1 ml l ⁻¹ of water	90.33	90.00	90.50	90.67	90.33	90.50
2 ml l ⁻¹ of water	90.00	90.67	90.17	90.00	90.00	90.00
3 ml l ⁻¹ of water	90.33	90.33	90.33	90.33	90.67	90.50
4 ml l ⁻¹ of water	90.00	90.67	90.33	90.00	90.33	90.17
5 ml l ⁻¹ of water	90.00	90.00	90.00	90.33	89.67	90.00
Mean	90.13	90.40		90.27	90.20	
Sources	Concentration of paraquat	Time of spray	Interaction	Concentration of paraquat	Time of spray	Interaction
S.E.m±	0.46	0.49	0.65	0.33	0.91	1.29
C.D. at 5%	NS	NS	NS	NS	NS	NS

Thomas *et al.* (2013), reported that paraquat acts by intercepting electrons on the reducing side of photosystem-I and cause rapid inactivating chlorophyll and oxidising chloroplast membrane, lipid and enhance drying of the crop. Padmaja *et al.* (2013) also observed that herbicidal defoliant injure the plant causing it to produce ethylene in response. Ethylene promotes leaf abscission by increasing the activity of enzymes such as pectinase and cellulase, which degrade cell walls and middle lamellae in the abscission zone of petiole. The germination per cent of greengram seeds did not differ significantly by application of the paraquat at 65 DAS and 70 DAS (Table 2). This indicated that application of desiccants may not impose adverse effect on germination of seed and its quality. The results

are in line with the findings of Emine *et al.* (2007) and Salari *et al.* (2013) who reported that diquat, glyphosate, paraquat or sodium chlorate application did not have any adverse effects on seed germination of cotton.

On the basis of present study it was concluded that application of paraquat @ 5 ml l⁻¹ of water at physiological maturity (70 DAS) was the optimum concentration to achieve higher defoliation, complete dryness of greengram leaves, and lower cost without adverse effect on germination per cent and was on par with 4ml/l. Defoliator application minimized the grain losses and quality deterioration and brought synchrony in harvesting and also helped to achieve harvest at the right time with optimum moisture content and facilitated mechanical harvesting.

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