

THE EFFICIENCY OF PARAQUAT IN RELATION TO ITS TIME OF APPLICATION*

Paraquat (1,1-dimethyl-4, 4-bipyridinium dichloride) belongs to bipyridinium compound and is related to quaternary ammonium occurring in solution as ions. Basically paraquat is a nonselective contact herbicide but may be translocated to some extent. The physiological action of paraquat arises from its ability to interfere with oxidation, reduction reaction in plants. It is soluble in water. It is non-explosive, nonvolatile, inactivated in soil and stable in alkaline conditions upto pH 11.0. This chemical is used for wide range of improvements as for pasture renovation, chemical ploughing, road side and industrial weed control. Paraquat acts entirely on foliage and is totally infective in the soil when applied to foliage. Contact action of this herbicide is very rapid showing symptoms like wilting followed by necrosis and ultimate death of entire leaf. Light, molecular oxygen and chlorophyll are required for the maximum development of phytotoxic symptoms. The present study was hence, taken up to investigate the influence of time of application on the activity of paraquat.

The experiment was conducted in pots at the Central Plant Protection Training Institute, Hyderabad. Paraquat (Gramaxone 23%) was sprayed at 0.5 kg ai/ha on 40 days old plants of *Vigna sinensis* and *Sorghum bicolor* at 30 psi. All the treatments given in Table 1 were repeated thrice. To provide maximum duration of light after application spraying was done at 06.00h in treatment No. 1.

Observations on the effect of light/dark period after spraying on the mortality/scorching were made on 10th, 15th and 25th day after spraying. The total affected and non-affected plants were counted and the average percent mortality/scorching was calculated. The data were analysed statistically after necessary transformation.

A quick scorching of the foliage was observed when paraquat was sprayed at 12.00 hours and 14.00 hours but the scorching was slow when paraquat was applied at 06.00 hours and 16.00 hours. Spraying of paraquat at 20.00 hours did not show any appreciable scorching till next day early morning. However, scorching increased with the day and by 10.00 hours the foliage was scorched completely. Scorching was more severe and quick in *V. sinensis* (dicot) than in *S. bicolor* (monocot).

After ten days of application, highest mortality of both the species, *V. sinensis* and *S. bicolor*, was recorded under the treatment when paraquat was

*This forms the research work submitted to the C. P. P. T. I., Hyderabad in partial fulfilment of the requirement for award of Post-Graduate Diploma in Plant Protection, during 1979.

sprayed at 20.00 hours, followed by mortality of *V. sinensis* when sprayed at 16.00 hours and mortality of *S. bicolor* when sprayed at 08.00 hours and 06.00 hours. However, there was no significant difference among these treatments.

Observation taken 15 days after application revealed that there was increase in mortality of *V. sinensis* under all the treatments. This may probably be due to the exposed growing points or structure of the leaves. In *S. bicolor* the increase was only marginal. There was no increase at all under the treatment when paraquat was applied at 08.00 hours which might have been due to the quick scorching and mortality of the localised tissues. The highest mortality of both the species was recorded under the treatment when spraying was done at 20.00 hours.

After 25 days of application, there was 93.34 to 100 per cent mortality of *V. sinensis* when paraquat was sprayed at different hours of the days. But there was no significant difference among the treatments. This may be due to the tender nature of the leaves of *V. sinensis* and that only very less food reserves are available in the stems. The other reason may be the complete killing of growing points by the contact action of the herbicides as they are exposed. Cent per cent mortality was recorded under the treatments when paraquat was sprayed at 20.00 hours followed by 98.7, 93.9 and 93.3 per cent mortality when sprayed 06.00 hours, 12.00 hours and 08.00 hours respectively. In *S. bicolor* mortality varying from 65.4 to 100.00 per cent was recorded under different treatments and there were significant difference. Cent per cent mortality occurred when spraying was done at 20.00 hours followed by 89.8, 87.7 and 77.1 per cent when spraying was done at 08.00 hours, 06.00 hours and 16.00 hours respectively. The lowest mortality (65.4%) was recorded under spraying at 12.00 hours. Spraying at 14.00 hours also recorded the low mortality (72.6%).

It is evident from the data in Table 1 (for *S. bicolor*) that when there was no light or the intensity of light was low (20.00 hours, 16.00 hours and 08.00 hours) the mortality was higher just after spraying and when the light intensity was high (12.00 hours and 14 hours) the mortality was low. This may be due to the immediate death of leaf tissues when exposed to high intensity of light and obviously the absorption of the herbicide would have been poor. On the contrary when there was insufficient or no light there would have been only little absorption and translocation of paraquat with the result that its phytotoxicity was more. These results are contrary to those reported by Carbett (1974).

From the studies conducted, it may be concluded that the time of application has no influence on the efficiency of paraquat against *V. sinensis*, a dicot having exposed growing point. But in the case of *S. bicolor*, a monocot in which the growing points are well protected, the time of application has significant influence. It is better to spray the paraquat in the evenings or early morning when light intensity is low.

Table 1

Effect of time of application on the efficacy of paraquat against *V. sinensis* and *S. bicolor*

Sl. No.	Time of spraying	Mortality %, days after application					
		10		15		25	
		<i>V. sin-ensis</i>	<i>S. bi-color</i>	<i>V. sin-ensis</i>	<i>S. bi-color</i>	<i>V. sin-ensis</i>	<i>S. bi-color</i>
1	Spraying at 06.00 h	65.71	80.70	90.00	85.96	98.67	87.72
2	Spraying at 08 00 h	70.04	86.30	77.72	86.30	93.34	89.80
3	Spraying at 12.00 h	80.28	47.65	91.39	50.83	96.94	65.38
4	Spraying at 14.00 h	68.34	50.08	91.13	64.73	100.00	72.61
5	Spraying at 16.00 h	88.30	59.91	98.41	63.66	100.00	77.08
6	Spraying at 20.00 h	100.00	100.00	100.00	100.00	100.00	100.00
7	Control	0.00	0.00	0.00	0.00	0.00	0.00

The author is indebted to Mr. Maiku Lall, Weed Specialist for the able guidance during the course of studies and the Director, C. P. P. T. I., Hyderabad, for the facilities provided.

സംഗ്രഹം

പാരകാററ് എന്ന കളനാശിനി പ്രയോഗിക്കുന്നതിന് ഏറ്റവും അനുയോജ്യമായ സമയം കണ്ടുപിടിക്കുന്നതിന് ഒരു പരീക്ഷണം ഹൈദരാബാദിലെ സെൻട്രൽ പ്ലാന്റ് പ്രൊട്ടക്ഷൻ ട്രെയിനിംഗ് ഇൻസ്റ്റിറ്റ്യൂട്ടിൽ നടത്തി.

ഭൂശൃമുകുളങ്ങളുള്ള ചിലമ്പ്രീക സസ്യമായ പയറിൽ വിവിധ സമയങ്ങളും പാരകാററിന്റെ പ്രവർത്തനത്തിനും തമ്മിൽ വലിയ ബന്ധമുള്ളതായി കണ്ടില്ല. എന്നാൽ അഭൂശൃമുകുളത്തോടുകൂടിയ ഏകപത്രിക സസ്യമായ ചോളത്തിൽ വിവിധ സമയങ്ങളും പാരകാററിന്റെ പ്രവർത്തനത്തിനും തമ്മിൽ വലിയ ബന്ധമുള്ളതായി കണ്ടു. സൂര്യപ്രകാശത്തിന്റെ കാഠിന്യം കുറഞ്ഞിരിക്കുന്ന വൈകുന്നേരമോ വെളുപ്പാൻ കാലത്തോ പാരകാററ് തളിക്കുന്നതാണ് കൂടുതൽ ഫലപ്രദമെന്ന് മനസ്സിലായി.

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