https://doi.org/10.29321/MAJ.10.A03707

Studies on Preemergence Screening and Mode of Selectivity of Experimental Herbicide 1—(3, 4-Dichlorophenyl)—3-Methyl—2-Pyrrolidinone

by

O. P. GUPTA[1]

Introduction: 1-(3,4-dichlorophenyl)-3-methyl-2-pyrrolidinone, technically called BV-201, is one of the recent experimental herbicides available for trial in India. Certain crop plants like *Triticum aestivum*, *Gossypium spp.*, *Arachis hypogaea*, *Pisum sativum* and *Solanum tuberosum* have already been reported moderately to highly tolerant to its preemergence application at 1—10 kg. *a.i.*/ha dose (Indofil, nd) The present communication provides information on the response of eleven more field crop plants cultivated in India to this compound. Also certain findings on nature of selectivity of BV-201 to *Triticum aestivum* have been reported. These two aspects are dealt with here separately.

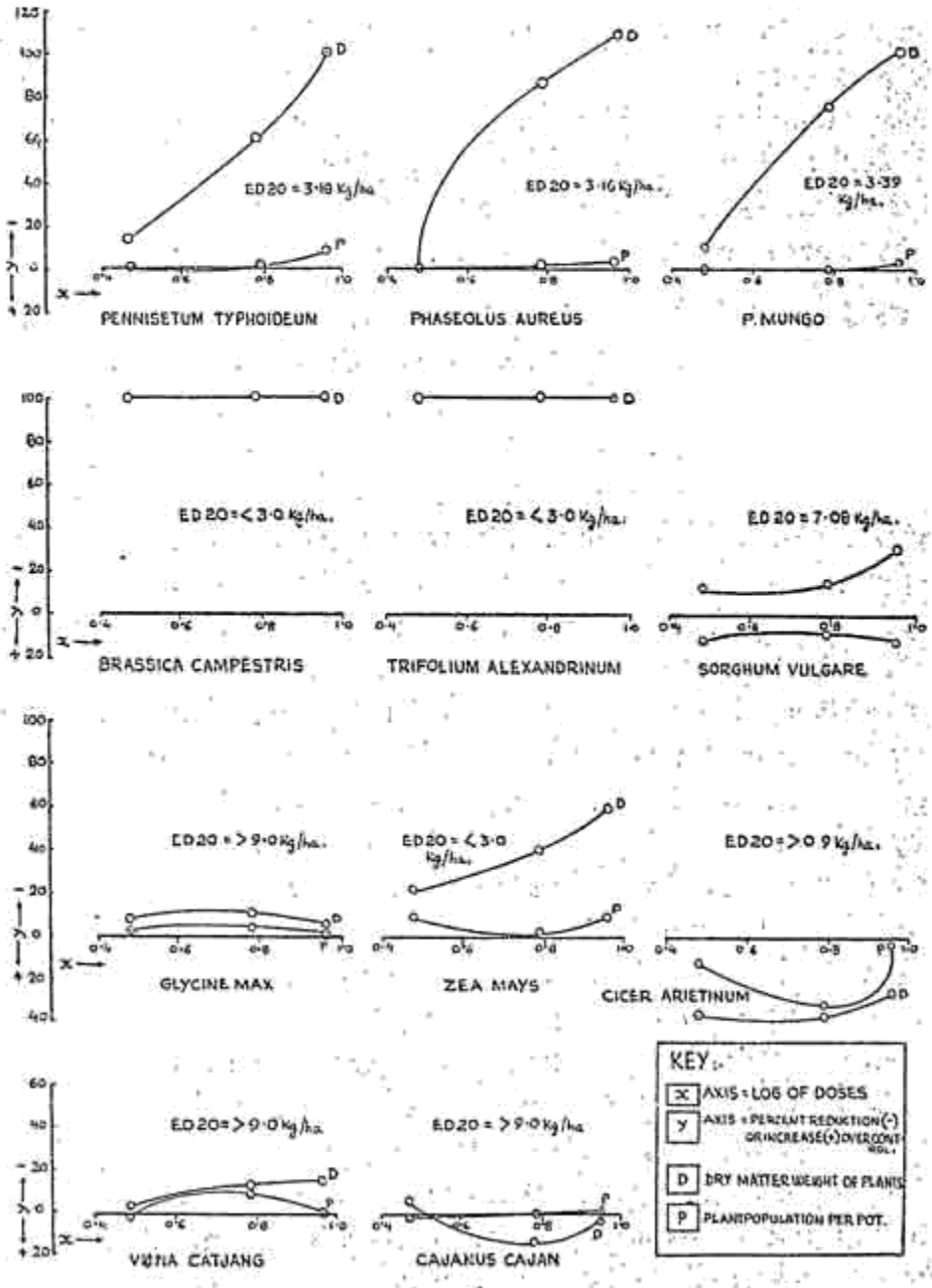
Material and Methods: (i) *Screening Tests*: Eleven crops included in these tests were *Pennisetum typhoideum*, *Phaseolus aureus*, *P. mungo*, *Trifolium alexandrinum*, *Brassica campestris*, *Sorghum vulgare*, *Glycine max*, *Zea mays*, *Cicer arietinum*, *Vigna catjang* and *Cajanus cajan*. For screening these, 22 cm diameter pots were filled with 2 kg. soil passed through 2 mm sieve after coating their inner surfaces with thin layer of wax. For each crop twelve such pots were prepared to accomodate three doses of BV-201 *i.e.* 3, 6 and 9 kg/ha and one untreated control, each replicated three times. The soil surface of each pot was then lightly tapped to smoothen it. Simultaneously healthy seeds of test crops were soaked in water and sprouted in electrical germinator. Of these, vigorous sprouts of each crop except those of *B. compestris* and *T. alexandrinum* were selected and dibbled ten in each earmarked pot at 2.5 cm depth. In case of *B. campestris* and *T. alexandrinum* 5 gm presoaked seeds of each were sown broadcast in respective pots and covered with a thin layer of dry soil. Immediately after planting, all the pots were irrigated to field capacity (32%) using 500 ml. water per pot. To avoid crusting of soil and consequent defective germination, this water was poured on filter paper discs placed on soil surface of each pot. The discs were removed after irrigation. Eight hours later, BV-201 was sprayed on moist soil surface of respective pots to give application rates of 3, 6 and 9 kg/ha as mentioned earlier with the help of micro hand sprayer. Pots were then kept covered till germination. After germination of plants pots were irrigated daily with 200 ml. water – a quantity predetermined by blank trials. These experiments were conducted in two seasons *i.e.* winter and summer depending upon the crop requirement.

---

1. Reader in Agronomy, R.C A., Udaipur.

Received on 28–8–1968.

Results: Periodical germination counts were made for each crop of which the last one recorded two weeks after planting was used for graphic presentation in Fig. 1. At this stage in case of *Cajanus cajan*, *Zea Mays* and *Vigna catjang* pots were thinned to contain only two representative plants/pot. Eight weeks after planting, the plants in each pot were cut from base, oven dried and weighed to constant weight. These data were tabulated as per cent reduction (−) or increase (+) over control at each test dose tried which are graphically presented in Fig. 1. Then by interpolation of 20% reduction over



control, corresponding log dose was seen to get ED20 values. Antilog of these values gave ED20 in terms of kg/ha which are shown in each graph of Fig. 1. Depending upon these ED20 values, the eleven test plants could be grouped into four susceptibility classes as in Table 1.

TABLE 1. *Susceptibility Classes of Test Crops for Preemergence BV-201.*

I. Susceptible (ED20=3 0 kg/ha)	II. Moderately susceptible (ED20=3-6 kg/ha)	III. Moderately tolerant (ED20=6-9 kg/ha)	IV. Tolerant (ED20=9.0 kg/ha)
1. *Brassica campestris*	1. *Pennisetum typhoideum*	1. *Sorghum vulgare*	1. *Cajanus cajan* -
2. *Trifolium alexandrinum*	2. *Phaseolus mungo*		2. *Vigna catjang*
3. *Zea mays*	3. *P. aureus*		3. *Cicer arietinum*
			4. *Glycine max*

N. B. ED20=Effective dose to cause 20% reduction over untreated control

From Table 1 it could be noted that the telerant group of crops with ED20 values of more than 9.0 kg/ha (BV-201) contained four legumes *viz. Cajanus cajan, Vigna catjang, Cicer arietinum* and *Glycine max*. However, since some legumes appear in susceptible groups too, it can be said that crop tolerance to BV-201 varies with individual plant species and does not go with a type of group of plants.

(ii) Mode of Tolerance of Wheat to BV-201: Preemergence application of BV-201 upto about 8 kg *a. i.*/ha has been reported selective to wheat in field conditions and this selectivity is considered physiological in nature (Indofil nd.). But the experiments reported here revealed that wheat was not completely tolerant to BV-201 and the selectivity observed in the field conditions was positional in nature.

BV-201 was applied as preemergence treatment after planting wheat in field as well as in 22 cm diameter pots. Pot culture technique used for the latter was the same as described earlier for screening tests. While in field trial grain yield of wheat was found to increase in BV-201 treated plots (Fig. 2a), in plot culture it (BV-201) seriously hampered its germination itself (Fig. 2b). On opening out the soil surface of treated pots it was revealed that it was only the emergence of wheat seedlings which was checked by BV-201 and not the sprouting of seeds since number of sprouted seeds within treated and untreated soils in the pots were equal. The sprouts in treated pots were abnormally shortened, thickened and curved backwards. Some of the coleoptiles had bursted within the soil to free the yellowish green twisted leaves. Seminal root formation looked normal. Analysing the cause of such a difference in field and pot tests when soil was the same in the two cases, two points of importance were noted. First, while the depth of planting in field was 6-7.5 cm, in pots it was 2.5 cm. Secondly, the pots were irrigated to field capacity immediately after planting as against 15 days later in case of field trial. Both these

conditions were more congenial to movement of BV-201 upto seed zone in pots than in the field. This observation was further supported when wheat was planted in BV-201 mixed soil at different concentrations, including control, in pots. Germination in treated soil was hampered the same way as noted earlier in preemergence treated pots (Fig. 2c).

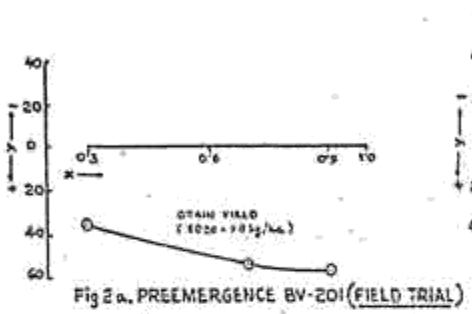


Fig 2 a. PREEMERGENCE BV-201 (FIELD TRIAL)

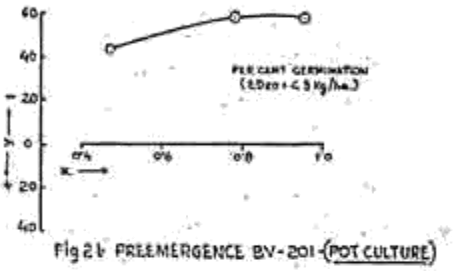


Fig 2 b PREEMERGENCE BV-201 (POT CULTURE)

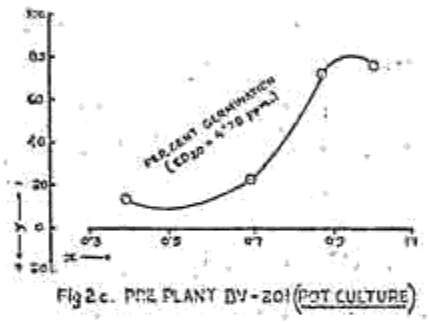


Fig 2 c. PRE PLANT BV-201 (POT CULTURE)

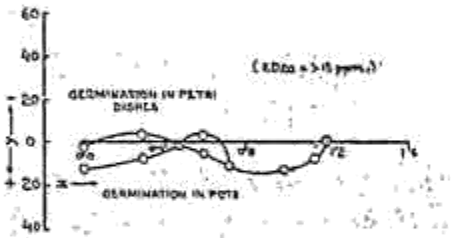


Fig 2 d. BV-201 PRE SOAKED WHEAT SEEDS GERMINATED IN POTS & PETRI DISHES.

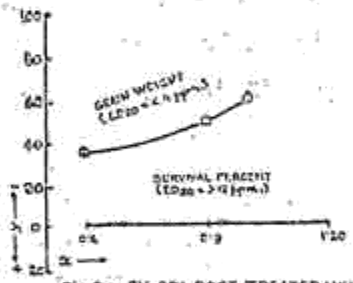
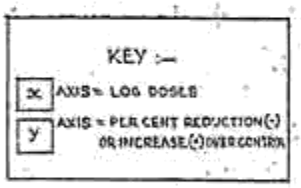


Fig 2 e. BV-201 ROOT TREATED WHEAT PLANTED IN POTS.



It was further interesting to note that when wheat seeds were soaked in solutions of different concentrations of BV-201 upto 15 ppm for 24 hours and planted in untreated pot soil as well as kept in petridishes in germinater, not only normal sprouting and germination occurred but there was a tendency towards stimulated emergence of wheat seedlings (Fig. 2d). This showed that reduced emergence of wheat seedlings in earlier mentioned pot experiments (Fig. 2b and 2c) was not due to direct absorption of BV-201 by wheat seeds but due to their coleoptiles coming in contact with treated 2.5 cm column of soil through which these were to penetrate. In field conditions, since BV-201 was restricted to surface layer during the period of wheat emergence, it remained unaffected.

It may further be pointed out that though seed absorbed BV-201 did not depress wheat emergence (Fig. 2d) yet the emerged seedlings succumbed to it completely within 15–30 days at presoaking dose of 3 ppm. BV-201 and above. The morphogenic effects noted included yellowing of leaf tips backward indicating probably some disturbance in their chlorophyll function by BV-201.

Not only seeds and coleoptiles, but also the roots and leaves of wheat exhibited sensitivity to BV-201 at herbicidal doses. For testing the former, germinated seedlings with well formed seminal roots were taken in lots of 10 plants and each fixed in a hole made in the centre of a plywood board piece. These were then kept in 100 cc beakers containing graded concentrations of 0–12 ppm BV-201 so that roots were dipped upto their 3/4th of length. This arrangement continued for 24 hours after which plants were removed and their roots were washed in flowing water. These were then planted in pots with three replications for each treatment and their survival percentage and grain yield were recorded after 150 days, which are shown in Fig. 2e. From this it is evident that root absorbed BV-201, did not completely kill the plants but stunted its growth and consequently reduced the grain yield with ED20 of 4 ppm.

High susceptibility of wheat leaves to BV-201 was noticed when wheat was treated with BV-201 at 5 kg/ha dose at its 2–3 leaf stage. Within 15 days of its application, lower leaves started wilting and drying without losing their green colour exhibiting desiccation effects. Slowly whole plant was involved and 100% mortality was observed.

From the above experiments it was clear that while all parts of *Triticum aestivum* were susceptible to BV-201 to variable degrees, the observed tolerance to it in the field condition was positional in nature and therefore should be dependent upon soil type, depth of planting and other agroclimatic conditions. Observed erratic selectivity of BV-201 to wheat even in field conditions by Rognon (1966) and Rognon and Ballacey (1965) is in agreement with lab experiments reported here.

Summary and Conclusions : Replicated lab and field experiments were conducted with two objectives *viz.* to study the mode of selectivity of BV-201 1-(3, 4-dichlorophenyl)-3-methyl-2-pyrrolidinone to *Triticum aestivum* and to screen eleven other crop plants for their tolerance to it. These studies indicated that high selectivity of BV-201 to *T. aestivum* reported in certain field conditions was positional in nature and not a physiological one since all its plant parts tested individually proved susceptible to it when brought in its direct contact. This should make the selectivity of BV-201 to *T. aestivum* (wheat) dependent upon soil and other agroclimatic conditions.

Of the eleven crop plants screened only *Cajanus cajan*, *Vigna catjang* *Cicer arietinum* and *Glycine max* exhibited tolerance to preemergence application of BV-201 with ED20 values of more than 9 kg/ha.

Acknowledgement: The author thanks Professor H. G. Singh, Head of the Department of Agronomy, R. C. A. Udaipur for providing necessary facilities for this work. Test compound used in the study was obtained by courtesy of Messrs Indofil Chemical Ltd., Bombay (India).

REFERENCES

Indofil (nd). Experimental herbicide BV-201. Tech. Bull. Indofil Chemicals Ltd., P. B. 1041, Bombay (India).

Rognon, J. 1966. A preemergence herbicide for wheat. *Le Producteur Agricole Francais*, 2:8.

———, and Ballacey, N. 1965. Trials for control of blackgrass (*Alopecurus myosuroids* Huds.) in winter cereals. 3rd Conf. Franc. Mauv. Herbes (COLUMA).