

## Arriving the dose of fluchloralin and pendimethalin for lentil [*Lens culinaris* L.] through bioassay in *terai* agro-ecological region of West Bengal

B. DE AND <sup>1</sup>B. DAS

Department of Agronomy, <sup>1</sup>Department of Agricultural Economics  
Uttar Banga Krishi Viswavidyalaya, Pundibari-736165,  
Cooch Behar, West Bengal

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The *terai* agro-ecological zone has a characteristic of typical sub-tropical humid climate with high annual rainfall (more than 3000 mm) and high relative humidity that result in aggressive growth of weed, which has high invasion potential. Multiple nutrient deficiencies mainly due to high rainfall and coarse texture soil and, aggressive growth of the weed are the main constraints of crop production. This led to the need to determine dose of herbicide like fluchloralin and pendimethalin as preemergence management of weeds in lentil. Bioassay is a useful technique for rapidly screening of herbicides for phytotoxicity and dose determination (Sandral *et al.*, 1997). It involves the biological response of plant species through per cent reduction in dry weight ( $\text{g plant}^{-1}$ ) (Tag-El-Din *et al.*, 1981). The bioassay experiment has been planned with the objective to determine dose of fluchloralin and pendimethalin against predominant weeds of lentil.

A field experiment was carried out during the *rabi* season of 2007-08 at the Research Farm of Uttar Banga Krishi Viswavidyalaya located at Pundibari, Cooch Behar, West Bengal. The soil of the experimental site was sandy loam in character with pH 5.85 available nitrogen  $217.65 \text{ kg ha}^{-1}$ , available phosphorus  $22.82 \text{ kg ha}^{-1}$ , available potassium  $174.68 \text{ kg ha}^{-1}$ . The locally cultivated lentil variety was used in the experiment. In lentil fluchloralin with the dose of 0.00, 0.30, 0.50, 0.70, 0.90, 1.10, 1.30, 1.50, 1.70 and  $1.90 \text{ kg ha}^{-1}$  and pendimethalin with the dose of 0.00, 0.10, 0.20, 0.30, 0.40, 0.50, 0.60, 0.70, 0.90 and  $1.00 \text{ kg ha}^{-1}$  were used in the field experiment having plot size of 2 sq m area. Visual observations were made everyday to understand the changes in growth behavior of the plants and appearance of phytotoxic symptoms owing to herbicidal toxicity on plant at different doses. Number of plants germinated was counted at 12, 20, 28 and 35 days after sowing (DAS). Biological response of plants to herbicides was determined by measuring the dry weight of the plants grown in herbicide treated soil with different doses and per cent growth inhibition of plant was calculated by comparing the dry weight of herbicide treated plant with healthy plant from untreated control plot. The

per cent growth inhibition value obtained at different herbicidal doses both in case of fluchloralin and pendimethalin were transformed to probit values and regressed against log values of the doses. The linear regression equation was computed by using excel programme  $Y = bx + a$  where Y indicates probit value of % dry weight reduction ( $\text{g plant}^{-1}$ ), b is regression coefficient, x is log dose of herbicide and a is intercept of Y.

Maximum doses of herbicide tolerated by lentil crop was equal to the dose that caused 10 per cent growth reduction of lentil ( $\text{GR}_{10}$ ) at initial stages and minimum dose required to make the herbicide effective was equal to the dose that cause 5 per cent growth reduction of lentil ( $\text{GR}_5$ ) at initial stages. Among the different weed flora of the experiment comprised are species of *Polygonum* like *P. persicaria* L. *P. pensylvanicum* L. *P. orientale* L. *P. odoratum* L. The phytotoxic effect to the lentil plant was manifested with characteristic stunted growth that appeared within 10-12 DAS.

### Calculation

For fluchloralin

$$Y = 1.6255x + 4.6107 \text{ and } r^2 = 0.9573$$

Calculation of  $\text{GR}_{10}$

$$Y = \text{Probit value of 10\% growth reduction of lentil i.e., } 3.72$$

$$3.72 = 1.6255x + 4.6107$$

$$\text{Then } x = -0.547, \text{ Anti log of } -0.547 = 0.50, \text{ then } \text{GR}_{10} = 0.50$$

$\text{kg ha}^{-1}$  dose of fluchloralin..... (i)

Calculation of  $\text{GR}_5$

$$Y = \text{Probit value of 5\% growth reduction of lentil i.e., } 3.35$$

$$3.35 = 1.6255x + 4.6107$$

$$x = -0.77558 \text{ and Anti log of } -0.77558 = 0.42, \text{ Then } \text{GR}_5 =$$

$0.42 \text{ kg ha}^{-1}$  dose of fluchloralin.

For pendimethalin

$$Y = 1.0941x + 4.812 \text{ \& } r^2 = 0.9638$$

Calculation of  $\text{GR}_5$

$$Y = \text{Probit value of 5\% growth reduction of weeds i.e. } 3.35$$

$$3.35 = 1.0941x + 4.780$$

$$\text{Then } x = -1.307, \text{ Antilog of } -1.307 = 0.13, \text{ then } \text{GR}_5 = 0.13 \text{ kg}$$

$\text{ha}^{-1}$  dose of pendimethalin.

Calculation of  $\text{GR}_{10}$

$$Y = \text{Probit value of 10\% growth reduction of weeds i.e. } 3.72$$

$$3.72 = 1.0941x + 4.780$$

$$\text{Then } x = -0.96883, \text{ Antilog of } -0.96883 = 0.176 \approx 0.2, \text{ then}$$

$\text{GR}_{10} = 0.2 \text{ kg ha}^{-1}$  dose of pendimethalin..... (ii)

Short communication

Email: biman\_de@rediffmail.com

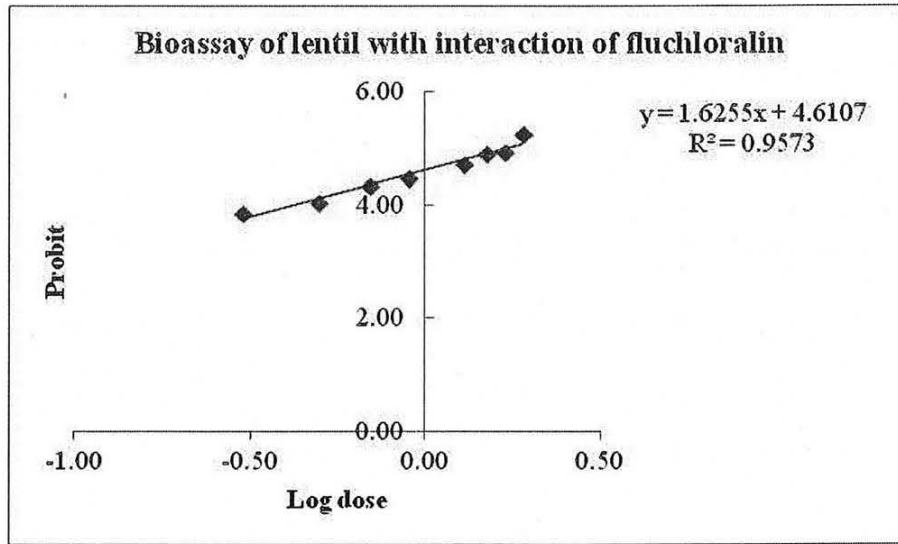


Fig. 1: Bioassay of lentil with interaction of fluchloralin

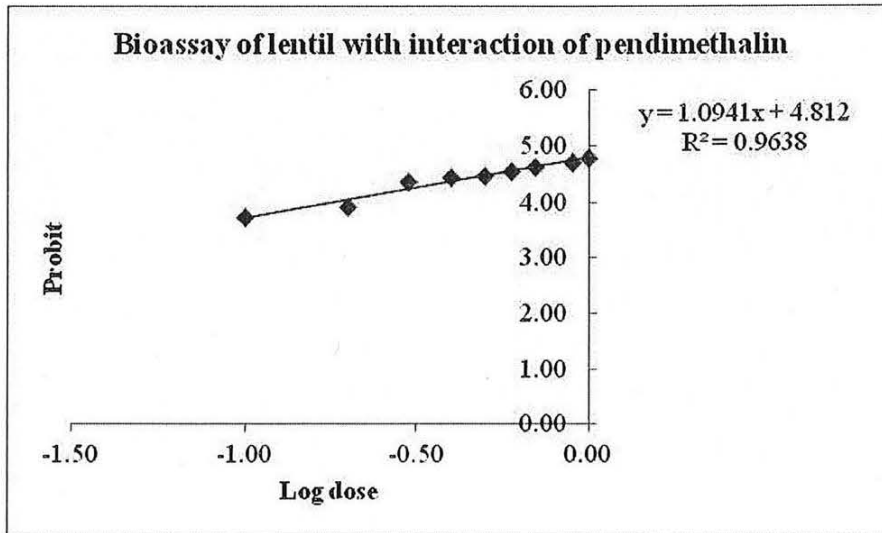


Fig. 2: Bioassay of lentil with interaction of pendimethalin

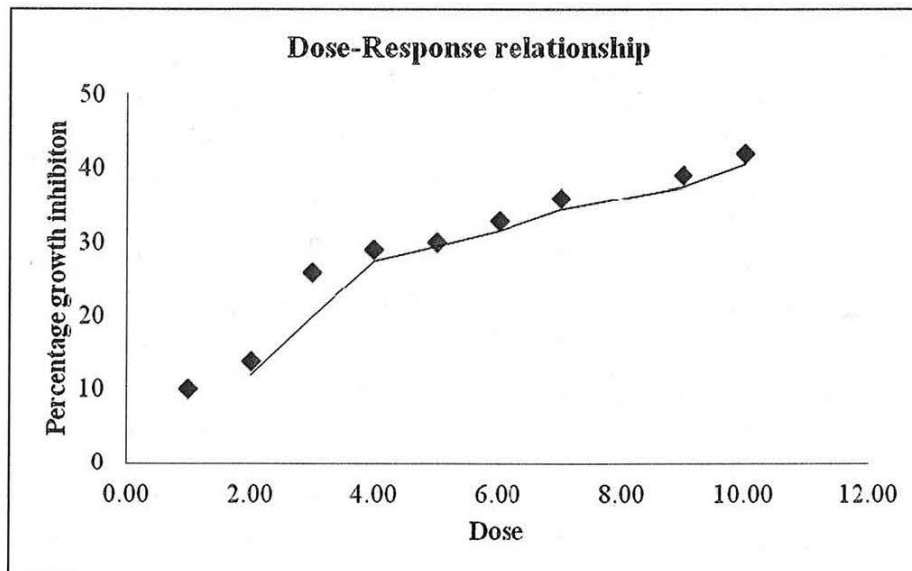


Fig. 3: Dose- response relationship

Maximum doses of herbicide tolerated by lentil crop was equal to the dose that caused 10 per cent growth reduction of lentil ( $GR_{10}$ ) at initial stages which is  $0.50 \text{ kg ha}^{-1}$  of fluchloralin and  $0.2 \text{ kg ha}^{-1}$  of pendimethalin for farmers at *terai* agro-ecological region of West Bengal.

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