*Journal of Crop and Weed* **1** (1) : 41-44 (2005)

# Persistence behaviour of Haloxyfop – A new Herbicide in/on Onion

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## ABSTRACT

Residual fate and behaviour of the herbicide haloxyfop in onion leaf, soil and bulb were studied at the Horticultural Research Farm, B.C.K.V., West Bengal, India, (2001-2002) following application @ 100, 200 and 400 g a.i $ha^{-1}$. Haloxyfop residue was derivatized by butylation before GLC analysis. Dissipation of haloxyfop in onion leaf and soil followed first order kinetics. The $DT_{50}$ values in onion leaf ranged from 3.24-6.71 days whereas 3.78-6.96 days for soil. No residue could be detected in bulb at harvest irrespective of doses.

Haloxyfop{(RS)-2-[4-(3-chloro-5-trifluoromethyl-2-pyridyloxy) phenoxy] propionic acid} introduced by Dow Elanco, USA is a selective, pre- and post-emergent herbicide for control of annual and perennial grasses in sugarbeet, fodder beet, oilseed rape, potatoes, leafy vegetables, onions, soybean, flax, strawberries, vines and other crops[1-4] . Laboratory studies showed that the ester hydrolyses rapidly to the acid, which then undergoes further degradation. The leaching behaviour and and soil dissipation was evaluated under field condition in northern Germany[5] . There appeared to be no relationship between absorption and translocation of haloxyfop and sensitivity of plant species [6] . Its efficacy reduced when mixed with herbicides active against broad leaved weeds and the addition of non ionic surfactant or an emulsifiable crop oil enhanced the activity on perennial grasses[1]. However, information regarding the residue and persistence of haloxyfop in onion under West Bengal condition is very limited.Thus, the present paper investigates the persistence of haloxyfop in onion under tropical condition.

## MATERIALS AND METHODS

**Experiment layout** : The experiment was conducted in onion (variety Sukhsagar ) at the Horticultural Research Farm, B.C.K.V., West Bengal, India, during winter season 2001-2002. This site had no previous history of haloxyfop application. The trial was of a randomized block design with three replication of each treatment along with an untreated control. Haloxyfop 10EC was applied @ 100, 200 and 400 g ai/ha (15 d after transplanting) as foliar spray with a high volume Knapsack sprayer and diluted with water @ 500 litre/ha.

**Sampling** : The soil samples from each plot were collected by soil auger (0-6 cm depth) at an intervals of 0, 3, 7, 10, 22, 30

and 60 days after herbicide application. The samples were then air dried at room temperature, ground and mixed thoroughly. A representative air dried sub sample (50 g) from each replicate was taken for analysis. Leaf samples were taken randomly at 0, 7, 10, 30 and 60 days after application and representative sample of 20 g was taken. Bulb samples were taken after harvesting and representative sample of 100 g was taken.

**Extraction** : The soil, leaf and bulb samples were suspended in 100 ml methanolic sodium hydroxide and kept overnight. Leaf and bulb samples were blended thoroughly in a Remi Automix blender for 2 min. and soil samples were stirred with same solvent for 2 hr. by mechanical shaker. All the samples were filtered through Buchner funnel.

**Clean up** : The filtrate from each matrices viz. leaves, soil and bulbs were transferred to a separating funnel and partitioned against dichloromethane (125 ml) along with distilled water (75 ml), 40-50 ml 2(N) $H_2SO_4$ . 25 ml $CH_2Cl_2$ was collected in a conical flask by passing over anhydrous sodium sulphate. Then 40 ml 5% sodium bicarbonate was added to the remaining mixture and shaken for 4-5 min and lower $CH_2Cl_2$ layer was discarded. The remaining mixture was then partitioned with 20 ml 2(N) $H_2SO_4$ and 20 ml $CH_2Cl_2$ and the $CH_2Cl_2$ layer was collected. Then the remaining solution was again partitioned with 25 ml $CH_2Cl_2$ and the $CH_2Cl_2$ layer was collected. All the $CH_2Cl_2$ fraction were combined and reduced to 5-6 ml by rotary vacuum evaporator at 50 °C.

**Derivatization** : The $CH_2Cl_2$ fraction was dried and 1.5 ml butylating agent (5 ml Conc. $H_2SO_4$ + 100 ml *n*-butanol) was added and placed in an oil bath at 100°C for 30 min. followed by partitioning with hexane(20 ml) and distilled water(20 ml) three times. The combined hexane fraction was then concentrated and the final volume was adjusted with distilled hexane (10 ml) for estimation of haloxyfop residue by GLC.

**Estimation** : The estimation was done by GLC (Hewlett Packard Model 5890A) equipped with $Ni^{63}$ ECD. The column was DB-1701 (30m, 0.53 mm id). The column, injector and detector temperatures were 220°, 220° and 300°C respectively, using $N_2$ as carrier gas with a flow rate of 70 ml/min. The retention time was 6.01 minutes.

**Recovery study** : The recoveries of haloxyfop in onion soil, bulb and leaves varied from 85.4% to 91.7%.

## RESULTS AND DISCUSSION

The results of haloxyfop residues occurring in onion leaf and soil at different days are presented in Table-1. The initial concentration of residue in onion leaf was found to vary from 0.99-2.64 ppm for single, double and triple dose. After 10 d the residue declined to 0.10 - 0.80 ppm, resulting a percentage dissipation of 89.8, 81.7 and 69.6%. The half lives for the three doses were found to be 3.24, 4.40 and 6.71 d respectively. In case of onion soil, the initial deposits were found to be in the range of 1.02 - 2.36 ppm irrespective of any treatment. The residue dissipated by 60.16-82.3% after 10 d. In case of $T_3$, after 22 days it dissipated to 0.23 ppm indicating a

percentage dissipation of 90.25%. The half lives were found to be 3.78, 5.26 and 6.96 d respectively. Dissipation followed first order kinetics in both the cases i.e. onion leaves and soil. No residues could be detected in harvest samples of soil, onion plant and bulb. So, this compound may safely be recommended for controlling a number of weeds in onion field.

**Table 1 Dissipation of Haloxyfop in onion leaves & soil**

| Substrate | Dose | Residues* in ppm(µg/g) at different days 0 | 7 | 10 | 30 | Half life (days) | Regression equation |
|---|---|---|---|---|---|---|---|
| Leaf | $T_1$ (100 gai/ha) | 0.99 | 0.36 (63.6) | 0.10 (89.8) | - | 3.24 | Y=3.04-0.092X |
| | $T_2$ (200 gai/ha) | 1.59 | 0.80 (49.6) | 0.29 (81.7) | - | 4.40 | Y=3.24-0.068X |
| | $T_3$ (400 gai/ha) | 2.64 | 1.59 (39.7) | 0.80 (69.6) | - | 6.71 | Y=3.44-0.04X |

| Substrate | Dose | Residues* in ppm (µg/g) at different days 0 | 3 | 7 | 10 | 22 | 30 | Half life (days) | Regression equation |
|---|---|---|---|---|---|---|---|---|---|
| Soil | $T_1$ (100 gai/ha) | 1.02 | 0.82 (19.6) | 0.31 (69.6) | 0.18 (82.3) | BDL | BDL | 3.78 | Y=3.06-0.07X |
| | $T_2$ (200 gai/ha) | 1.35 | 1.02 (24.4) | 0.88 (37.7) | 0.31 (97.03) | BDL | BDL | 5.26 | Y=3.17-0.05X |
| | $T_3$ (400 gai/ha) | 2.36 | 1.31 (44.49) | 1.02 (56.77) | 0.94 (60.16) | 0.23 (90.25) | BDL | 6.96 | Y=3.32-0.04X |

* Average of three replications. Data in the parenthesis indicates % dissipation.

**ACKNOWLEDGEMENT**

The authors are thankful to M/s. DE-NOCIL Crop Protection Limited,Mumbai for supplying formulation and analytical grade of haloxyfop and financial assistance for carrying out this work.

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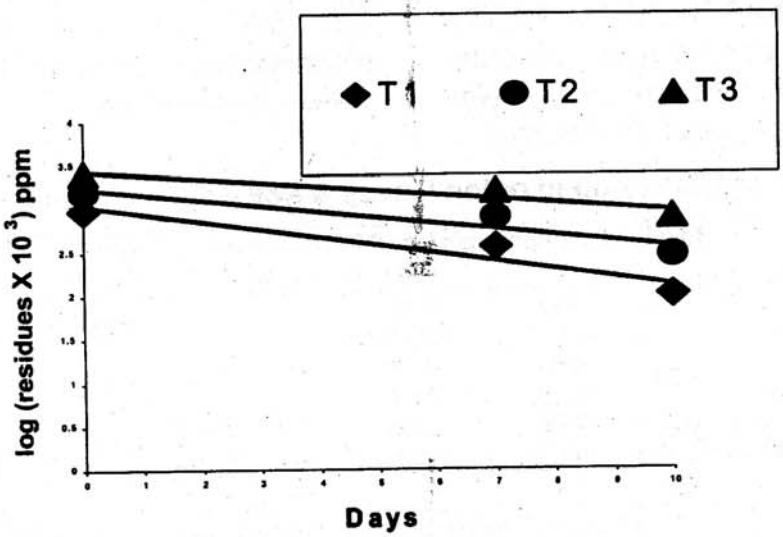


Fig.1. Linear plot for 1 st. order kinetics of Haloxyfop in onion leaves

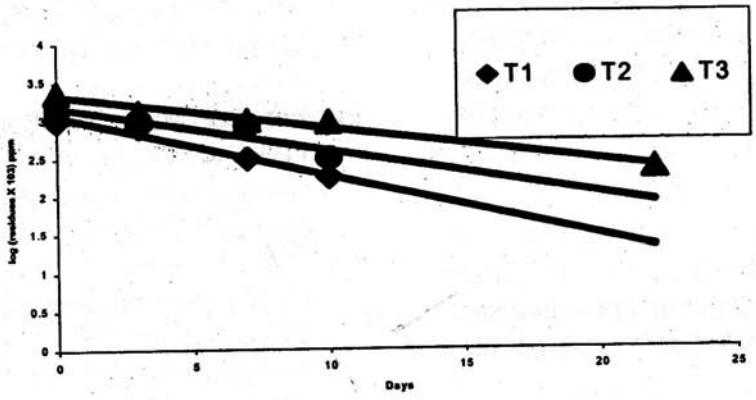


Fig.2. Linear plot for 1 st. order kinetics of Haloxyfop in onion crop soil.