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**Kadu SP**

B. A. College of Agriculture,  
Anand Agricultural University,  
Anand, Gujarat 388 110, India

**Patel BD**

B. A. College of Agriculture,  
Anand Agricultural University,  
Anand, Gujarat 388 110, India

**Patel RB**

B. A. College of Agriculture,  
Anand Agricultural University,  
Anand, Gujarat 388 110, India

**Desai CK**

B. A. College of Agriculture,  
Anand Agricultural University,  
Anand, Gujarat 388 110, India

**Chaudhary DD**

B. A. College of Agriculture,  
Anand Agricultural University,  
Anand, Gujarat 388 110, India

**Correspondence****Kadu SP**

B. A. College of Agriculture,  
Anand Agricultural University,  
Anand, Gujarat 388 110, India

## Weed management practices effect on weed flora and weed control efficiency in onion (*Allium cepa* L.) field

**Kadu SP, Patel BD, Patel RB, Desai CK and Chaudhary DD**

**Abstract**

A field experiment was conducted during *rabi* seasons of year 2014-15 and 2015-16 at the farm of AICRP weed management, B. A. College of Agriculture, Anand Agricultural University, Anand (Gujarat) to study the integrated efficacy of various herbicides applied as pre- and post-emergence in onion (*Allium cepa* L.). Among the different weed management practices, inter-culturing and hand weeding carried out at 20 and 40 DATP were found most efficient having lowest weed dry weight with higher weed control efficiency. Further, pre- and post-emergence application of pendimethalin applied @ 1000 g ha<sup>-1</sup> or pre- and post-emergence application of oxyfluorfen applied @ 150 g ha<sup>-1</sup> proved to be efficient in reducing weed dry weight and higher weed control efficiency in onion field.

**Keywords:** Onion, Herbicides

**Introduction**

Onion (*Allium cepa* L.) belongs to the family *Amaryllidaceae* is one of the most important vegetable crops all over the world. Onion is an important condiment and vegetable for Indians. The aggregatum group of cultivars (*A. cepavar. aggregatum*) includes both shallots and bulb onions (Sharma, 2014). Weed management is an important practice in process of cultivation of any field crops. Weed is any plant that is a hazard, nuisance or causes injury to man or his desired crops. In addition, their cylindrical upright leaves do not shade the soil to smother weed growth. On the other hand, use of herbicides alone does not prove effective for broad spectrum weed control because of their selectivity and environmental hazards with its continuous use. Addition of FYM in onion is general practices to obtain higher bulb yield with better quality. (Kalhapure *et al.* 2014) [5].

**Materials and Methods**

The field experiment was conducted at AICRP weed management, B. A. College of Agriculture, Anand Agricultural University, Anand (Gujarat) during *rabi* seasons of the year 2014-15 and 2015-16. The soil of experimental field was sandy loam in texture having low in available nitrogen and medium in phosphorus and high in potassium and high in pH 8.2. The experiment is laid out in factorial randomized block design with four replications. The well decomposed FYM applied as per the treatments. Sixteen treatment combinations with two treatments of farm yard manure (M<sub>0</sub>: No FYM and M<sub>1</sub>: FYM @ 10 t ha<sup>-1</sup>) along with eight treatments of weed management practices comprised (W<sub>1</sub>: Pendimethalin @ 1000 g ha<sup>-1</sup> pre-transplant, W<sub>2</sub>: Pendimethalin @ 1000 g ha<sup>-1</sup> post-transplant (3-4 DATP) W<sub>3</sub>: Oxyfluorfen @ 150 g ha<sup>-1</sup> pre-transplant, W<sub>4</sub>: Oxyfluorfen @ 150 g ha<sup>-1</sup> post-transplant [4-5 leaf stage of weeds *i.e.* (15-20 DATP)] W<sub>5</sub>: Oxadiargyl @ 100 g ha<sup>-1</sup> pre-transplant, W<sub>6</sub>: Oxadiargyl @ 100 g ha<sup>-1</sup> post-transplant [4-5 leaf stage of weeds *i.e.* (15-20 DATP)], W<sub>7</sub>: Hand weeding at 20 and 40 DATP and W<sub>8</sub>: Weedy check). The farm yard manure was applied at rate of 10 t ha<sup>-1</sup> as applied by calculating quantity of per plot. The herbicides were applied using knapsack sprayer fitted with flat fan nozzle by mixing in 500 litre of water/ha as per treatment. Onion seedlings *cv.* Pusa red was transplanted 15 × 10 cm in all two years of experimentation. All recommended package and practices was adopted to raise the crop. The weed count and dry weight of weeds were recorded from randomly selected four spots by using 0.25 m<sup>2</sup> iron quadrat from net plot through destructive sampling at 30, 60 DATP and at harvest. The weed control efficiency for each treatment was calculated by using the following formula by.

**Results and Discussion****Weed Flora**

The predominant weed flora of the experimental field was consisted of *Chenopodium album*, *Melilotus indica* L., *Digera arvensis* Forst., *Trianthema monogyana* L., *Boerhavia diffusa* L.,

*Dactyloctenium aegyptium* L., *Eleusin indica* L. Gaertn., *Chloris barbata* L., *Asphodelus tenuifolius* L. and *Cyprus rotundus*. The highest relative density was recorded by *Dactyloctenium aegyptium* L. among the monocot weeds and *Chenopodium album* L. among the dicot weeds during both the years of experimentation, respectively.

**Effect of Farm yard manure**

The significantly highest weed density and weed dry weight were recorded under treatment farm yard manure @ 10 t ha<sup>-1</sup> as compared to no farm yard manure treatment during the year 2014-15 and 2015-16 while, pooled analysis failed to show significant variation at 30 DATP however, significant difference was noticed at 60 DATP and at harvest. This might be due increased organic matter which helps to supplied nutrients through farm yard manure to crops as well as weeds. The significantly lowest weed density and weed dry weight is recorded under treatment No FYM application during both the

year of experimentation and in pooled analysis.

**Effect of weed management practices**

The result indicated that among the different weed management practices, HW at 20 and 40 DATP recorded significantly the lowest weed dry weight of monocot, dicot and total weeds with higher weed control efficacy at 30, 60 DATP and at harvest. Whereas application of pendimethalin @ 1000 g ha<sup>-1</sup> recorded significantly lowest weed dry weight of monocot, dicot and total weeds with higher weed control efficiency at 30, 60 DATP and at harvest followed by treatment pendimethalin @ 1000 g ha<sup>-1</sup> as post-transplant, oxyflurofen @ 150 g ha<sup>-1</sup> as pre-transplant and oxadiargyl @ 100 g ha<sup>-1</sup> as post-transplant. Weedy check (W<sub>8</sub>) recorded minimum weed control efficacy owing to uncontrolled conditions favoured luxurious weed growth leading to increased weed dry matter. These findings are also supported by Poddar *et al.* (2014) [7].

**Table 1:** Total Weeds (monocot and dicot) and weed dry weight as influenced by FYM and different weed management practices (two years pooled data)

| Treatments  | Monocot weeds (No. m <sup>-2</sup> ) |                 | Dicot weeds (No. m <sup>-2</sup> ) |                   | Total weeds (No. m <sup>-2</sup> ) |                   |                   | Total weed dry weight (g m <sup>-2</sup> ) |                   |                   | WCE (%) | HEI (%) |
|---|--------------------------------------|-----------------|------------------------------------|-------------------|------------------------------------|-------------------|-------------------|--|-------------------|-------------------|---------|---------|
|   | 30 DATP                              | 60 DATP         | 30 DATP                            | 60 DATP           | 30 DATP                            | 60 DATP           | At harvest        | 30 DATP                                    | 60 DATP           | At harvest        |         |         |
| <b>Farm Yard Manure</b>   |                                      |                 |                                    |                   |                                    |                   |                   |  |                   |                   |         |         |
| M <sub>0</sub> : No FYM   | 1.97<br>(4.32)                       | 2.46<br>(6.21)  | 8.87<br>(126.38)                   | 11.45<br>(181.73) | 9.13<br>(130.70)                   | 11.72<br>(187.94) | 10.50<br>(115.09) | 3.74<br>(21.56)                            | 8.07<br>(81.89)   | 14.01<br>(220.49) | -       | -       |
| M <sub>1</sub> : FYM @ 10 t ha <sup>-1</sup>  | 2.95<br>(9.12)                       | 3.24<br>(11.71) | 11.66<br>(172.52)                  | 13.25<br>(216.15) | 12.03<br>(181.64)                  | 13.65<br>(227.86) | 11.24<br>(135.08) | 4.73<br>(30.53)                            | 9.56<br>(111.37)  | 15.77<br>(263.69) | -       | -       |
| S. Em±  | 0.17                                 | 0.03            | 0.19                               | 0.18              | 0.19                               | 0.17              | 0.17              | 0.07                                       | 0.15              | 0.28              | -       | -       |
| LSD (P=0.05)  | NS                                   | 0.09            | 0.55                               | 0.51              | 0.53                               | 0.49              | 0.47              | 0.21                                       | 0.41              | 0.78              | -       | -       |
| <b>Weed management practices</b>  |                                      |                 |                                    |                   |                                    |                   |                   |  |                   |                   |         |         |
| W <sub>1</sub> : Pendimethalin @ 1000 g ha <sup>-1</sup> pre-transplant   | 1.61<br>(2.35)                       | 1.75<br>(2.67)  | 3.76<br>(18.75)                    | 8.36<br>(74.61)   | 4.06<br>(21.10)                    | 8.54<br>(77.28)   | 8.66<br>(75.20)   | 2.30<br>(5.48)                             | 4.88<br>(24.37)   | 10.49<br>(128.58) | 95.70   | 4.07    |
| W <sub>2</sub> : Pendimethalin @ 1000 g ha <sup>-1</sup> post-transplant (3-4 DATP)                               | 1.85<br>(3.31)                       | 2.13<br>(4.14)  | 5.20<br>(34.58)                    | 8.83<br>(82.13)   | 5.54<br>(37.89)                    | 9.06<br>(86.27)   | 9.16<br>(84.66)   | 2.43<br>(5.85)                             | 6.27<br>(39.89)   | 12.08<br>(152.87) | 95.41   | 3.27    |
| W <sub>3</sub> : Oxyflurofen @ 150 g ha <sup>-1</sup> pre-transplant  | 2.23<br>(4.75)                       | 2.41<br>(5.49)  | 7.31<br>(56.59)                    | 9.24<br>(87.17)   | 7.62<br>(61.34)                    | 9.53<br>(92.66)   | 10.24<br>(104.98) | 3.42<br>(11.95)                            | 6.56<br>(45.81)   | 14.18<br>(211.62) | 90.63   | 2.20    |
| W <sub>4</sub> : Oxyflurofen @ 150 g ha <sup>-1</sup> post-transplant [4-5 leaf stage of weeds i.e. (15-20 DATP)] | 2.63<br>(6.83)                       | 3.58<br>(12.72) | 11.84<br>(143.11)                  | 13.89<br>(195.31) | 12.12<br>(149.94)                  | 14.35<br>(208.03) | 11.54<br>(133.85) | 4.28<br>(18.54)                            | 11.35<br>(133.10) | 17.56<br>(311.75) | 85.46   | 0.80    |
| W <sub>5</sub> : Oxadiargyl @ 100 g ha <sup>-1</sup> pre-transplant   | 3.67<br>(13.53)                      | 4.00<br>(16.17) | 16.77<br>(285.33)                  | 15.37<br>(238.44) | 17.16<br>(298.86)                  | 15.89<br>(254.61) | 12.54<br>(160.75) | 4.58<br>(21.47)                            | 12.29<br>(154.13) | 18.12<br>(330.43) | 83.16   | 0.63    |
| W <sub>6</sub> : Oxadiargyl @ 100 g ha <sup>-1</sup> post-transplant [4-5 leaf stage of weeds i.e. (15-20 DATP)]  | 2.38<br>(5.72)                       | 3.11<br>(9.48)  | 11.15<br>(127.67)                  | 11.06<br>(123.75) | 11.40<br>(133.39)                  | 11.48<br>(133.23) | 10.92<br>(120.11) | 3.67<br>(13.81)                            | 10.19<br>(106.56) | 16.25<br>(269.27) | 89.17   | 1.42    |
| W <sub>7</sub> : Hand weeding at 20 and 40 DATP   | 1.39<br>(1.91)                       | 1.45<br>(1.62)  | 3.52<br>(13.58)                    | 4.46<br>(21.30)   | 3.75<br>(15.49)                    | 4.65<br>(22.92)   | 8.00<br>(64.75)   | 1.98<br>(3.77)                             | 2.91<br>(8.65)    | 10.05<br>(109.91) | 97.04   | -       |
| W <sub>8</sub> : Weedy check  | 3.92<br>(15.34)                      | 4.36<br>(19.36) | 22.60<br>(515.99)                  | 27.63<br>(768.79) | 22.94<br>(531.33)                  | 27.98<br>(788.15) | 15.90<br>(256.38) | 11.25<br>(127.49)                          | 16.09<br>(260.52) | 20.37<br>(422.29) | 0.00    | -       |
| S. Em±  | 0.10                                 | 0.06            | 0.39                               | 0.36              | 0.38                               | 0.35              | 0.34              | 0.15                                       | 0.29              | 0.55              | -       | -       |
| LSD (P=0.05)  | 0.27                                 | 0.18            | 1.09                               | 1.01              | 1.07                               | 0.98              | 0.94              | 0.42                                       | 0.82              | 1.56              | -       | -       |
| M × W.S. Em   | 0.14                                 | 0.24            | 0.55                               | 0.51              | 0.54                               | 0.49              | 0.47              | 0.21                                       | 0.60              | 1.65              | -       | -       |
| LSD (P=0.05)  | NS                                   | NS              | 1.55                               | 1.43              | 1.51                               | 1.39              | NS                | NS   | NS                | NS                | -       | -       |
| C.V. (%)  | 15.67                                | 9.10            | 15.15                              | 11.65             | 14.40                              | 11.00             | 12.35             | 14.16                                      | 13.27             | 14.90             | -       | -       |

\*Figures in the parenthesis are original values. All Figures are subjected to transformed values to square root (√ x + 0.5).

**Table 3:** Number of dicot weeds at 30 & 60 DATP as influenced by interaction various herbicides applied with and without farm yard manure (two years pooled data)

| Treat.         | W <sub>1</sub>  |                   | W <sub>2</sub>  |                   | W <sub>3</sub>  |                   | W <sub>4</sub>    |                   | W <sub>5</sub>    |                   | W <sub>6</sub>    |                   | W <sub>7</sub>  |                 | W <sub>8</sub>    |                   |
|----------------|-----------------|-------------------|-----------------|-------------------|-----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-----------------|-----------------|-------------------|-------------------|
|                | 30 DATP         | 60 DATP           | 30 DATP         | 60 DATP           | 30 DATP         | 60 DATP           | 30 DATP           | 60 DATP           | 30 DATP           | 60 DATP           | 30 DATP           | 60 DATP           | 30 DATP         | 60 DATP         | 30 DATP           | 60 DATP           |
| M <sub>0</sub> | 1.56<br>(2.04)  | 6.50<br>(44.79)   | 2.54<br>(6.26)  | 7.01<br>(51.14)   | 5.63<br>(32.28) | 8.40<br>(71.26)   | 10.95<br>(120.95) | 13.47<br>(181.44) | 15.58<br>(248.93) | 15.22<br>(232.25) | 10.54<br>(111.23) | 10.31<br>(107.74) | 2.32<br>(4.92)  | 3.40<br>(12.23) | 21.85<br>(484.42) | 27.33<br>(752.98) |
| M <sub>1</sub> | 5.95<br>(35.46) | 10.22<br>(104.44) | 7.87<br>(62.89) | 10.64<br>(113.13) | 8.98<br>(80.91) | 10.08<br>(103.09) | 12.73<br>(165.27) | 14.31<br>(209.17) | 17.95<br>(321.74) | 15.52<br>(244.63) | 11.76<br>(144.12) | 11.82<br>(139.77) | 4.72<br>(22.25) | 5.51<br>(30.36) | 23.36<br>(547.56) | 27.93<br>(784.61) |
|                | LSD (P=0.05)    |                   | 30 DATP         |                   | 1.55            |                   |                   |                   | C.V %             |                   | 30 DATP           |                   | 15.15           |                 |                   |                   |
|                |                 |                   | 60 DATP         |                   | 1.43            |                   |                   |                   |                   |                   | 60 DATP           |                   | 11.65           |                 |                   |                   |

\*Figures in the parenthesis are original values. All Figures are subjected to transformed values to square root (√ x + 0.5).

**Table 3:** Density of weeds (monocot and dicot) at 30 & 60 DATP as influenced by interaction various herbicides applied with and without farm yard manure (two years pooled data)

| Treat.         | W <sub>1</sub>  |                   | W <sub>2</sub>  |                    | W <sub>3</sub>  |                   | W <sub>4</sub>    |                   | W <sub>5</sub>    |                    | W <sub>6</sub>    |                   | W <sub>7</sub>  |                 | W <sub>8</sub>    |                   |  |
|----------------|-----------------|-------------------|-----------------|--------------------|-----------------|-------------------|-------------------|-------------------|-------------------|--------------------|-------------------|-------------------|-----------------|-----------------|-------------------|-------------------|--|
|                | 30 DATP         | 60 DATP           | 30 DATP         | 60 DATP            | 30 DATP         | 60 DATP           | 30 DATP           | 60 DATP           | 30 DATP           | 60 DATP            | 30 DATP           | 60 DATP           | 30 DATP         | 60 DATP         | 30 DATP           | 60 DATP           |  |
| M <sub>0</sub> | 1.89<br>(3.29)  | 6.67<br>(46.80)   | 2.92<br>(8.17)  | 7.25<br>(54.38)    | 5.96<br>(36.28) | 8.68<br>(76.02)   | 11.13<br>(125.04) | 13.79<br>(190.41) | 15.88<br>(258.03) | 15.56<br>(242.79)  | 10.65<br>(113.50) | 10.61<br>(114.06) | 2.46<br>(5.58)  | 3.64<br>(13.77) | 22.11<br>(495.52) | 27.56<br>(765.48) |  |
| M <sub>1</sub> | 6.23<br>(38.85) | 10.41<br>(108.22) | 8.16<br>(67.57) | 10.87<br>(118.17)  | 9.28<br>(86.38) | 10.38<br>(109.31) | 13.11<br>(174.81) | 14.90<br>(225.64) | 18.44<br>(339.66) | 16.21<br>(266.44)  | 12.15<br>(153.24) | 12.35<br>(152.41) | 5.04<br>(25.38) | 5.67<br>(32.07) | 23.78<br>(567.11) | 28.40<br>(810.84) |  |
|                |                 | LSD<br>(P=0.05)   |                 | 30 DATP<br>60 DATP |                 | 1.51<br>1.39      |                   | C.V %             |                   | 30 DATP<br>60 DATP |                   | 14.40<br>11.00    |                 |                 |                   |                   |  |

\*Figures in the parenthesis are original values. All Figures are subjected to transformed values to square root ( $\sqrt{x + 0.5}$ ).

### Interaction effect

No farm yard manure in combination with HW at 20 and 40 DATP recorded significantly lower number of monocot, dicot weeds, total weeds and weed dry weight of weeds at 30, 60 DATP and at harvest during both year of experimentation and in pooled analysis.

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