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# Effect of crop weed competition on the performance of direct seeded onion (*Allium cepa* L.)

**K.N. KALYANA MURTHY, P.S.FATHIMA* AND A.VIDYA**
Department of Agronomy, College of Agriculture, V.C.Farm, MANDYA(KARNATAKA) INDIA

## ABSTRACT

**An experiment was conducted to investigate the critical period of crop – weed competition and efficient weed control measures to obtain higher bulb yield in direct seeded onion. The trial consisted of five weed free, five weedy treatments and each of weedy check and weed free check treatments, laid out in randomised block design with three replications. Maximum bulb yield (160.58 q ha$^{-1}$) was achieved by maintaining weed free condition upto 60 days after sowing and further weed free condition did not increase the yield significantly. The increase in yield was due to more number of leaves (6.45 plant$^{-1}$), plant dry weight (4.78 g plant$^{-1}$) and yield components like bulb diameter (4.92 cm) with more per cent of large and medium sized bulbs. The most critical period of crop weed competition was between 20 to 55 DAS.**

**Key words :** Onion, Bulb yield, Bulb diameter, Crop–weed competition, Weed index

## INTRODUCTION

In the development of a crop there is a critical stage at which the competitive ability of the crop is low and the presence of weeds will reduce the yield considerably. The critical period of crop-weed competition varies from crop to crop, variety to variety, method of establishment of crop and crop growth in the initial stages. The yield reduction is as high as 78 per cent in direct seeded onion (Westra *et al*., 1990). Hence, elimination of competition by weeds during the critical period would help the crop to grow well and consequently yield better. Therefore, it is imperative to determine the critical period of crop-weed competition in direct seeded onion so as to obtain maximum benefits from effective weed management practices and also to manage the weeds most efficiently and effectively. An investigation to determine the critical period of crop – weed competition and efficient weed control methods to obtain higher yields in direct seeded onion was taken up.

## MATERIALS AND METHODS

The experiment was conducted in the farmer field at Kurlahally village of Chickballapur Taluk in Kolar District of Karnataka State during *rabi* - summer seasons of 1997-98 and 1998-99. The soil of the experimental site was sandy loam in texture and moderate in fertility. The soil was neutral in reaction and was high in organic matter, low in nitrogen, medium in available phosphorus and low in available potassium. The experiment consisted of five weed free, five weedy treatments and each of weedy check and weed free check treatments, laid out in randomised block design with three replications. The data on weed count and weed dry weight was subjected to square root transformation using the formula $\sqrt{X+0.5}$. The onion variety used was "Bangalore rose". The colour of the bulb is dark red with high pungency and the small bulb size.

## RESULTS AND DISCUSSION

The important weed species observed in the experimental field consisted of grassy weeds such as, *Eragrostis ciliensis* L., *Dactyloctenium aegyptium* L., *Dicanthium annulatum* L., *Digitaria mariginata* L., and *Cynodon dactylon* L. Among broad leaved weed species *Galensoga parviflora* L., *Cenebra didyma* L., *Amaranthus viridis* L., *Oxalis latifolia* H.B. and K., *Phyllanthus niruri* L., *Ageratum conyzoides* L., *Euphorbia hirta* L., *Portulaca oleracea* L., *Lactuca runcinata* L., *Commelina benghalensis* L., *Parthenthium hysterophorus* L., *Euphorbia geniculata* L., *Argimone mexicana* L., *Lagasca mollis* L., and *Acanthospermum hispidum* L., were predominant and among sedges *Cyperus rotundus* L., and *Cyperus flageratus* L. were observed.

Total weed population and dry weight differed significantly among different treatments due to weed free and weedy treatments (Table 1). At 15 DAS, weed free period treatments recorded zero total weed population and dry weight. Among weedy period treatments total weed population ranged from 27.83 to 33.33 m$^{-2}$ and 3.55 to 3.75 g m$^{-2}$.

At 30 DAS, weed free periods upto 30, 45, 60, 75 DAS and weed free check and weedy upto 15 DAS resulted in significantly lowest total weed population (0.00 m$^{-2}$) and dry weight (0.00 g m$^{-2}$). At 45 DAS, significantly lowest total weed population (0.00 m$^{-2}$) and dry weight

* Author for correspondence

**Table 1 : Total weed population ($m^{-2}$) and weed dry weight (g $m^{-2}$) at different growth stages as influenced by crop - weed competition in direct seeded onion ( Average of two years data)**

| Treatments | 15 DAS | | 30 DAS | | 45 DAS | | 60 DAS | | 75 DAS | | At harvest | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Weed count | Weed dry weight | Weed count | Weed dry weight | Weed count | Weed dry weight | Weed count | Weed dry weight | Weed count | Weed dry weight | Weed count | Weed dry weight |
| $T_1$: Weed free upto 15 DAS | 0.70 | 0.70 | 16.09 | 2.79 | 19.28 | 7.08 | 20.01 | 14.66 | 20.37 | 18.09 | 20.69 | 18.11 |
| | (0.00) | (0.00) | (258.83) | (7.31) | (371.33) | (49.72) | (400.33) | (214.49) | (414.66) | (327.00) | (427.83) | (327.83) |
| $T_2$: Weed free upto 30 DAS | 0.70 | 0.70 | 0.70 | 0.70 | 8.11 | 2.34 | 11.06 | 3.54 | 12.90 | 6.30 | 13.04 | 7.22 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (65.50) | (5.00) | (121.99) | (12.10) | (165.99) | (39.37) | (169.83) | (53.26) |
| $T_3$: Weed free upto 45 DAS | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 7.96 | 2.42 | 9.73 | 4.28 | 10.40 | 5.48 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (62.99) | (5.40) | (94.49) | (17.80) | (107.83) | (29.61) |
| $T_4$: Weed free upto 60 DAS | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 6.81 | 2.34 | 7.60 | 3.49 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (46.16) | (5.0) | (60.5) | (11.78) |
| $T_5$: Weed free upto 75 DAS | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 6.53 | 2.61 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (42.33) | (6.35) |
| $T_6$: Weed free check | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 |
| | (0.00) | (0.00 | (0.00) | (0.00) | 0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| $T_7$: Weedy upto 15 DAS | 5.61 | 2.01 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 |
| | (31.16) | (3.56) | (0.00) | (0.00 | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| $T_8$: Weedy upto 30 DAS | 5.81 | 2.03 | 16.96 | 3.68 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 |
| | (33.33) | (3.64) | (287.83) | (13.95) | (0.00) | (0.00 | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| $T_9$: Weedy upto 45 DAS | 5.72 | 2.01 | 17.77 | 3.79 | 22.20 | 8.44 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 |
| | (32.33) | (3.55) | (315.66) | (13.95) | (492.66) | (70.80) | (0.00) | (0.00 | (0.00) | (0.00) | (0.00) | (0.00) |
| $T_{10}$: Weedy upto 60 DAS | 5.30 | 2.01 | 17.76 | 3.70 | 22.04 | 8.57 | 22.11 | 17.98 | 0.70 | 0.70 | 0.70 | 0.70 |
| | (27.83) | (3.57) | (315.15) | (13.28) | (485.66) | (73.19) | (489.16) | (322.99) | (0.00) | (0.00 | (0.00) | (0.00) |
| $T_{11}$: Weedy upto 75 DAS | 5.83 | 2.00 | 17.40 | 3.71 | 21.53 | 8.43 | 21.73 | 17.74 | 21.38 | 19.17 | 0.70 | 0.70 |
| | (30.16) | (3.75) | (302.49) | (13.33) | (463.99) | (70.74) | (472.33) | (314.33) | (456.99) | (367.33) | (0.00) | (0.00 |
| $T_{12}$: Weedy check | 5.56 | 2.02 | 18.22 | 3.82 | 22.71 | 8.72 | 22.78 | 18.01 | 22.31 | 12.82 | 22.50 | 20.14 |
| | (30.49) | (3.59) | (331.99) | (14.19) | (515.33) | (75.70) | (518.99) | (324.16) | (497.66) | (369.99) | (506.0) | (405.49) |
| S.E. + | 0.083 | 0.010 | 0.150 | 0.045 | 0.100 | 0.60 | 0.090 | 0.040 | 0.089 | 0.050 | 0.121 | 0.55 |
| C.D. (P=0.05) | 0.243 | 0.029 | 0.439 | 0.131 | 0.293 | 0.175 | 0.263 | 0.117 | 0.261 | 0.146 | 0.354 | 0.161 |

DAS : Days after sowing

(0.00 g $m^{-2}$) were noticed with weed free upto 45,60, 75 DAS, weedy upto 15 and 30 DAS and weed free check treatments. Highest total weed population and dry weight were with weedy check (515.33 $m^{-2}$ and 75.70 g $m^{-2}$, respectively) followed by weedy upto 45 DAS (492.66 $m^{-2}$ and 70.80 g $m^{-2}$, respectively), 60 DAS (485.66 $m^{-2}$ and 73.19 g $m^{-2}$, respectively), 75 DAS (463.99 $m^{-2}$ and 70.74 g $m^{-2}$, respectively) and weed free upto 15 DAS (371.33 $m^{-2}$ and 49.72 g $m^{-2}$, respectively). At 60 DAS, the treatments *viz*., weed free upto 60 and 75 DAS, weed free check, weedy upto 15, 30 and 45 DAS recorded significantly lowest total weed population (0.00 $m^{-2}$) and dry weight (0.00g $m^{-2}$). The highest weed population and dry weight was with weedy check (518.99 $m^{-2}$ and 324.16 g $m^{-2}$, respectively) followed by weedy upto 60 DAS (489.16 $m^{-2}$ and 322.99 g $m^{-2}$), 75 DAS (472.33 $m^{-2}$ and 314.33 g $m^{-2}$, respectively) and weed free upto 15 DAS (400.33 $m^{-2}$ and 214.49 g $m^{-2}$, respectively).

At 75 DAS, the total weed population and weed dry weight observed was zero with weed free check, weed free upto 75 DAS, weedy upto 15, 30, 45 and 60 DAS. Highest weed population and dry weight were recorded with weedy check (497.66 $m^{-2}$ and 369.99 g $m^{-2}$, respectively) followed by weedy upto 75 DAS (456.99 $m^{-2}$ and 367.33 g $m^{-2}$, respectively) and weed free upto 15 DAS (414.66 $m^{-2}$ and 327.00 g $m^{-2}$, respectively). At harvest, all the weedy periods and weed free check recorded significantly lowest total weed population (0.00 $m^{-2}$) and weed dry weight (0.00 g $m^{-2}$). Highest weed population and dry weight were with weedy check (506 $m^{-2}$ and 405.49 g $m^{-2}$, respectively) and weed free upto 15 DAS (427.83 $m^{-2}$ and 327.83 g $m^{-2}$, respectively).

The maximum reduction in weed dry weight were no ticed in plots, which was kept weed free for initial 60 days (11.78 $gm^{-2}$) and recorded significantly lowest total weed population (60.50 $m^{-2}$). The weeds that emerged after 60 DAS did not cause significant reduction in plant growth and bulb yield. Weed free condition for the initial 30 and 45 DAS were unable to check the late emerging weeds and their dry matter accumulation as they recorded relatively higher total weed population of 169.83 and 107.83 $m^{-2}$ and weed dry weight of 53.26 and 29.61 g $m^{-2}$, respectively. The maximum number of weeds per unit area occurred between 30-45 DAS. While, higher dry matter accumulation with weeds was noticed between 45-60 DAS.

The data on number of leaves $plant^{-1}$ as influenced by weed free and weedy periods are furnished in Table 2. At 60 DAS significantly highest leaves $plant^{-1}$ (5.79) were recorded with weedy upto 15 and 30 DAS and were at par with weed free upto 30, 45, 60 and 75 DAS and weed free check. At 75 DAS, significantly highest number of leaves were recorded with weedy upto 15 DAS (6.88 $plant^{-1}$) and was at par with weed free upto 30 and 60 DAS and weed free check. Similarly, at harvest, weedy upto 15 DAS treatment recorded significantly maximum number of leaves (6.93 $plant^{-1}$) and was at par with weed free upto 30, 60 and 75 DAS, weedy upto 30 DAS and weed free check treatments.

Dry weight of plant differed significantly at different

**Table 2 : Number of leaves $plant^{-1}$ and plant dry weight ( g $plant^{-1}$) at different growth stages as influenced by crop - weed competition in direct seeded onion (Average of two years data)**

| Treatments | 30 DAS | | 45 DAS | | 60 DAS | | 75 DAS | | At harvest | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Leaves $plant^{-1}$ | Dry weight | Leaves $plant^{-1}$ | Dry weight | Leaves $plant^{-1}$ | Dry weight | Leaves $plant^{-1}$ | Dry weight | Leaves $plant^{-1}$ | Dry weight |
| $T_1$: Weed free upto 15 DAS | 3.06 | 0.029 | 3.62 | 0.22 | 4.84 | 0.73 | 5.77 | 1.05 | 5.68 | 1.46 |
| $T_2$: Weed free upto 30 DAS | 3.41 | 0.031 | 3.93 | 0.32 | 5.77 | 1.35 | 6.50 | 1.87 | 6.61 | 2.85 |
| $T_3$: Weed free upto 45 DAS | 3.20 | 0.038 | 3.74 | 0.40 | 5.15 | 1.40 | 5.09 | 2.31 | 5.65 | 4.47 |
| $T_4$: Weed free upto 60 DAS | 3.08 | 0.031 | 3.79 | 0.41 | 5.75 | 1.43 | 6.35 | 2.59 | 6.45 | 4.78 |
| $T_5$: Weed free upto 75 DAS | 3.45 | 0.034 | 3.70 | 0.42 | 5.55 | 1.50 | 6.10 | 2.59 | 6.28 | 5.02 |
| $T_6$: Weed free check | 3.10 | 0.034 | 3.75 | 0.42 | 5.67 | 1.48 | 6.82 | 2.64 | 6.88 | 4.88 |
| $T_7$: Weedy upto 15 DAS | 2.94 | 0.030 | 4.00 | 0.40 | 5.79 | 1.48 | 6.88 | 2.53 | 6.93 | 4.98 |
| $T_8$: Weedy upto 30 DAS | 2.96 | 0.034 | 3.44 | 0.24 | 5.79 | 1.17 | 6.33 | 2.21 | 6.44 | 4.34 |
| $T_9$: Weedy upto 45 DAS | 3.08 | 0.033 | 3.55 | 0.21 | 4.43 | 0.65 | 5.18 | 1.32 | 5.12 | 2.19 |
| $T_{10}$: Weedy upto 60 DAS | 3.05 | 0.033 | 3.70 | 0.23 | 4.16 | 0.71 | 4.19 | 1.01 | 4.21 | 1.51 |
| $T_{11}$: Weedy upto 75 DAS | 3.05 | 0.036 | 3.48 | 0.21 | 4.13 | 0.74 | 4.22 | 0.84 | 4.49 | 1.41 |
| $T_{12}$: Weedy check | 2.92 | 0.033 | 3.95 | 0.20 | 3.80 | 0.72 | 4.04 | 0.77 | 4.42 | 1.31 |
| S.E. ± | 0.10 | 0.01 | 0.08 | 0.01 | 0.16 | 0.04 | 0.25 | 0.06 | 0.35 | 0.09 |
| C.D. (P=0.05) | NS | NS | NS | 0.04 | 0.46 | 0.12 | 0.84 | 0.17 | 1.02 | 0.28 |

DAS : Days after sowing NS=Non significant

crop growth stages among the treatments due to crop weed competition (Table 2). At 45 and 60 DAS, significantly highest plant dry weight was recorded with weed free upto 75 DAS (0.42 and 1.50 g plant$^{-1}$, respectively) and were at par with weed free check, weed free upto 45 and 60 DAS and weedy upto 15 DAS. The plant dry weight recorded at 75 DAS, in the weed free check treatment (2.64 g plant$^{-1}$) was significantly higher compared to other treatments except weed free upto 75 DAS (2.59 g plant$^{-1}$), 60 DAS (2.59 g plant$^{-1}$) and weedy upto 15 DAS (2.53 g plant$^{-1}$). Similarly, at harvest, significantly maximum plant dry weight was produced with weed free upto 75 DAS (5.02 g plant$^{-1}$) and was at par with weed free upto 60 DAS (4.78 g plant$^{-1}$), weedy upto 15 DAS (4.98 g plant$^{-1}$) and weed free check (4.88 g plant$^{-1}$). The lowest dry weight was recorded with weedy check (1.31 g plant$^{-1}$) and was at par with weedy upto 60 and 75 DAS and weed free upto 15 DAS.

The data on proportion of different grades of bulbs *viz*., large, medium and small sized bulbs varied among different treatments due to crop weed competition (Table 3). Weed free condition upto 75 DAS has produced highest per cent of large sized bulbs (39 %) followed by weedy upto 15 DAS (37 %), weed free check (35 %) and weed free upto 60 DAS (34 %). Similarly, maximum per cent of medium sized bulbs was obtained with weed free check (47%) followed by weed free upto 60 DAS (45%), 75 DAS (43.5 %) and weedy upto 15 DAS (43.5 %). Lowest per cent of small sized bulbs was noticed among the treatments *viz*., weed free upto 75 DAS (17.5 %), weed free check (18 %), weedy upto 15 DAS (19.5 %) and weed free upto 60 DAS (21 %). This was merely due to low weed density and weed dry weight resulted in least crop weed competition. Allowing weeds to compete beyond 15 DAS resulted in drastic reduction in bulb size and produced higher per cent of small sized bulbs which ranged from 50 to 90 per cent among different weedy periods, mainly due to crop weed competition resulting in poor uptake of nutrients by the plant leading to poor plant growth and small sized bulbs. The results are in accordance with the work of Hewson and Roberts (1971), Gajraj Singh and Pandey (1982).

The weed free check had significantly maximum bulb diameter (5.18 cm) and was at par with weed free upto 75 DAS (5.02 cm) and 60 DAS (4.92 cm) followed by weedy upto 15 DAS (4.85 cm). This was perhaps due to better growth under relatively weed free environment which resulted in maximum availability of nutrients, light, space and moisture. Lowest bulb diameter was exhibited with weedy check (1.13 cm) which was at par with weedy upto 60 DAS (1.32 cm), 75 DAS (1.20 cm), weed free upto 15 DAS (1.36 cm) and 30 DAS (1.85 cm). This indicated that keeping the crop free from weeds for initial 30 DAS was found inadequate as weeds that emerged late caused significant reduction in bulb diameter compared to season long weed free condition.

The cured bulb yield differed significantly due to crop weed competition (Table 3). Significantly highest bulb yield

**Table 3 : Effect of different weedy and weed free periods on bulb yield, bulb diameter, grades of bulb and weed index in direct seeded onion**

| Treatments | Grades of bulb ( % ) | | | Bulb diameter ( cm) | | | Bulb Yield (q ha$^{-1}$) | | | Weed index ( % ) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Large ( Above 25 g) | Medium (10 – 25 g) | Small (Below 10 g) | 1997-98 | 1998-99 | Pooled | 1997-98 | 1998-99 | Pooled | |
| $T_1$: Weed free upto 15 DAS | 1.5 | 6.5 | 92.0 | 1.54 | 1.19 | 1.36 | 29.43 | 32.21 | 30.82 | 81.38 |
| $T_2$: Weed free upto 30 DAS | 13.5 | 28.5 | 58.0 | 1.92 | 1.78 | 1.85 | 79.40 | 85.27 | 82.35 | 50.27 |
| $T_3$: Weed free upto 45 DAS | 31.0 | 41.5 | 27.5 | 4.04 | 4.08 | 4.06 | 125.54 | 118.88 | 122.21 | 26.20 |
| $T_4$: Weed free upto 60 DAS | 34.0 | 45.0 | 21.0 | 4.85 | 5.00 | 4.92 | 158.50 | 162.66 | 160.58 | 5.02 |
| $T_5$: Weed free upto 75 DAS | 39.0 | 43.5 | 17.5 | 4.93 | 5.12 | 5.02 | 164.16 | 161.38 | 162.77 | 2.83 |
| $T_6$: Weed free check | 35.0 | 47.0 | 18.0 | 4.81 | 5.56 | 5.18 | 164.00 | 167.21 | 165.80 | 0.00 |
| $T_7$: Weedy upto 15 DAS | 37.0 | 43.5 | 19.5 | 4.87 | 4.84 | 4.85 | 166.50 | 164.99 | 165.74 | 0.03 |
| $T_8$: Weedy upto 30 DAS | 17.5 | 32.5 | 50.0 | 3.31 | 2.97 | 3.14 | 117.49 | 113.88 | 115.68 | 30.22 |
| $T_9$: Weedy upto 45 DAS | 6.5 | 11.0 | 82.5 | 1.66 | 1.58 | 1.62 | 76.93 | 79.15 | 78.04 | 52.99 |
| $T_{10}$: Weedy upto 60 DAS | 3.0 | 9.0 | 88.0 | 1.26 | 1.38 | 1.32 | 34.71 | 36.66 | 35.68 | 78.57 |
| $T_{11}$: Weedy upto 75 DAS | 2.0 | 8.0 | 90.0 | 1.19 | 1.22 | 1.20 | 32.50 | 30.00 | 31.25 | 81.24 |
| $T_{12}$: Weedy check | 1 | 5.5 | 93.5 | 1.11 | 1.16 | 1.13 | 23.50 | 25.00 | 24.25 | 85.47 |
| S.E. ± | - | - | - | 0.10 | 0.11 | 0.11 | 2.78 | 2.81 | 2.80 | - |
| C. D (P=0.05) | - | - | - | 0.31 | 0.32 | 0.31 | 8.03 | 8.12 | 8.08 | - |

DAS : Days after sowing

was obtained with weed free check (165.80 q $ha^{-1}$) which was at par with weedy upto 15 DAS (165.74 q $ha^{-1}$) and weed free upto 75 DAS (162.77 q $ha^{-1}$) and 60 DAS (160.58 q $ha^{-1}$). The bulb yield increased with increase in weed free periods due to better growth as indicated by more number of leaves $plant^{-1}$ and plant dry weight in these treatments. Significantly lowest bulb yield was recorded with weedy check (24.25 q $ha^{-1}$) followed by weedy upto 75 DAS (31.25 q $ha^{-1}$) and weed free upto 15 DAS (30.82 q $ha^{-1}$) was due to reduction in the plant dry weight (1.31, 1.41 and 1.46 g $plant^{-1}$, respectively) and number of leaves $plant^{-1}$ (4.42, 4.49 and 5.68, respectively). Further, yield was significantly reduced even though weeds were removed during the first 45 days (26.20 %) which signifies that direct seeded onion requires weed free condition for more than 45 days to avoid crop – weed competition and to achieve higher yield in conformity with the work of Singh and Singh (1994).

Allowing weeds to compete with the crop for 15, 30, 45, 60 and 75 days resulted in reduction in bulb yield as indicated by weed index values to an extent of 0.03, 30.22, 52.99, 78.57 and 81.24 per cent, respectively over weed free check (0.00 %). It is clear that with delay in weeding from 30 to 75 DAS significant reduction in yield was noticed (32.22 to 81.22 %). This indicates that onion crop is poor competitor due to initial slow growth, short stature, non branching habit, sparse foliage and shallow root system. The results are in accordance with the findings of Wicks *et al*. (1973) and Rathinam *et al*. (1976).

Weed index is the competition offered by the weeds as measured by reduction in bulb yield. Least competition was offered by weeds with the treatments weedy upto 15 DAS, weed free upto 75 DAS and 60 DAS as they recorded lowest weed index of 0.03, 2.83 and 5.02 per cent, respectively. Whereas, highest competition by the weeds was noticed with weedy check (85.47 %) followed by weedy upto 75 DAS (81.24 %) and 60 DAS (78.57%) and weed free upto 15 DAS (81.38%). Onion crop takes 7-8 days for germination of seeds and there after its growth is slow upto 30 DAS during which period the weeds take advantage and out grow the crop by depleting more nutrients and moisture from the soil and suppress the growth of onion crop.

It is evident from the results of the present investigation that direct seeded onion crop requires weed free condition upto 60 DAS for achieving higher bulb yield and better growth and yield components. The most critical period of crop weed competition was between 20 to 55 DAS.

## REFERENCES

**Gajraj Singh, K.P. and Pandey, U.C. (1982).** Effect of weedicides on weed control and yield in onion. *Pesticides*, **16** (10) : 9-12.

**Hewson, R.T. and Roberts, H.A. (1971).** The effect of weed removal at different times on the yield of bulb onions. *J. Hort. Sci.*, **16** (1) : 471-483.

**Rathinam, P., Selvarangaraju, G., Sankaran, N., Sankaran, S. and Morachan, Y.B. (1976).** Studies on crop weed competition and chemical weed control in groundnut. *Madras Agric. J.*, **63** : 454-457.

**Singh, M.P. and Singh, K.P. (1994).** Effect of crop weed competition on growth and yield of *kharif* onion. *Indian J. Weed Sci.*, **26**(3&4) : 18-24.

**Wicks, G.A., Jhonston, D.N., Nuland, D.S. and Kinbacher, E.J. (1973).** Competition between annual weeds and sweet special onions. *Weed Sci.*, **21**(5): 436-439.

**Westra, P., Pearson, C.H. and Ristan, R. (1990).** Control of Venice mallow (*Hibiscus trionum*) in corn and onions. *Weed Technol.*, **4** (3) : 500-504.

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# Integrated nutrient management in rice-maize crop sequence

**M.S. TALATHI*, S.S. PINJARI, N.J. RANSHUR, T.S. BHONDAVE AND J.S. SURYAWANSHI**
Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, RATNAGIRI (M.S.) INDIA

## ABSTRACT

**The field experiment was conducted during rainy and winter seasons of 1998 and 99 at the Agronomy Farm, College of Agriculture, Dapoli, dist. Ratnagiri to study the integrated nutrient management in rice – maize crop sequence. The grain yield of rainy season rice was higher under 50% recommended NPK through fertilizers + 50% N either through glyricidia or FYM. Application of NPK at suboptimal dose *i.e.* 75 % and 50 % recommended dose of fertilizer reduced grain yield of rice significantly. The total productivity of rice – maize crop sequence was higher when 50% recommended NPK through fertilizers + 50% N through glyricidia was applied to rice and 75 % recommended dose of fertilizer to succeeding maize crop. The maize crop supplied with 100% recommended dose of fertilizer registered significantly higher cob yield. The total productivity (net return, B: C ratio) was higher when both the crops supplied with 100 % recommended dose of fertilizer. The N, P, K uptake was more when rice crop received 50 % N substitution either through glyricidia or FYM. Where as in winter season, the maximum uptake of nutrients by maize was recorded when 100 % NPK was supplied as inorganic source.**

**Key words :** Rice-maize sequence, Integrated nutrient management, Net profit, Nutrient uptake

## INTRODUCTION

In absence any significant scope for horizontal expansion and to meet the ever increasing demand for food, fuel and fodder, the vertical expansion in agriculture through increased production per unit area and per unit time is the only alternative, which involves the intensive use of resources and input. But inadequate / unbalanced use of fertilizers and organic manures are resulting in the improvement of soil health. Therefore, increasing the production and productivity on sustainable basis is a challenge before the agricultural scientists and planners.

The rice – maize is a major cropping system of the country but the average productivity of the system, which was less. Rice – maize sequential cropping is an important cropping system needs large amount of nutrients to achieve high productivity. The long term experiment at many locations have indicated that even with application of recommended dose of fertilizers (NPK), it will not be possible to sustain the productivity of rice – maize system and emphasize the importance of integrated nutrient supply system in sustaining productivity (Hedge, 1996). This involves the use of chemical fertilizers in conjunction with organic sources such as green manuring, FYM etc. This approach restores and sustains soil health and productivity in long term (Mitra *et al.*, 1992), besides meeting the nutritional deficiencies which are likely to occur due to continuous and intensive cultivation (Hegde, 1996). Therefore, the present investigation was initiated to study the effect of integrated nutrient supply of chemical fertilizers and organic sources on productivity and soil fertility in rice – maize sequence under South Konkan coastal zone of Maharashtra.

## MATERIALS AND METHODS

The field experiment was conducted in the rainy (*kharif*) and winter (*rabi*) seasons of 1998 and 1999 at Agronomy farm, College of Agriculture, Dapoli, dist. Ratnagiri. The soil of experimental plot was clay loam in texture with pH 6.36, organic carbon 1.30 g $kg^{-1}$; and the available nitrogen 295.22 kg $ha^{-1}$, phosphorus 12.96 kg $ha^{-1}$ and potassium 105.03 kg $ha^{-1}$. There were 11 different treatment combinations (Table 1) replicated thrice in Randomized Block Design. Rice (var. Sahyadri) and maize (var. Konkan tapora) were grown as the test crop. The recommended dose of fertilizer was 100:50:50 and 120:60:60 N, P and K kg $ha^{-1}$ for rice and maize, respectively. In case of rice, fertilizers was applied in three slit doses, 40 % N + full P and K was applied as a basal dose *i.e.* at transplanting, 40 % N was applied 30 DAT (maximum tillering) and remaining 20 % N was applied at 60 DAT (panicle initiation) whereas in case of maize, half N and whole quantity of P and K was applied as a basal dose and half N 30 DAS. The treatment comprised application of different combinations of inorganic and organic sources of nutrients to rice and inorganic sources to maize. The grain and straw of rice, and grain, stover of maize samples were analyzed for their N content by Kjeldahl method. The samples were digested in diacid ($HNO_3$, $HClO_4$, 4:1) mixture. Phosphorus was estimated in diacid digest by vanadomolybdo phosphoric yellow colour method. The extract was used for determination of potassium by flame photometer. Data on grain and straw yield, total productivity/ha/year (grain and biomass), gross monetary returns, net monetary returns and benefit: cost ratio were obtained from the

*** Author for correspondence**