

## **Influence of intercropping and weed-control measures on suppression of weeds and productivity of spring season sunflower (*Helianthus annuus*) and groundnut (*Arachis hypogaea*)**

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### **ABSTRACT**

An experiment conducted during the spring season of 1996 and 1997 with sunflower (*Helianthus annuus* L.) and groundnut (*Arachis hypogaea* L.) intercropping revealed that sole sunflower recorded the lowest count of weeds and dry matter. Sunflower grown at 100 cm in 1:2 ratio of intercropping recorded significantly higher yield attributes than sole sunflower. The yield parameters of groundnut were significantly suppressed in intercropping systems. The seed and biomass yields of both component crops were reduced by intercropping. Weed-control measures significantly enhanced the yield attributes and yield of sunflower and groundnut. Combined application of Pendimethalin and 1 hand-weeding recorded the lowest weed dry weight and the highest yield of both crops.

**Key words :** Intercropping, Weed control, Sunflower, Groundnut

It has been established that spring-season sunflower and groundnut give higher yields than rainy season ones in NWPZ of India. Therefore, growing of sunflower and groundnut in intercropping during spring season has immense potential to boost the oilseed production. It has also been reported that intercropping systems are more effective than monocropping in suppression of weeds but their effectiveness varies greatly (Girjesh and Patil, 1991). Information available on the suppression of weeds effect of sunflower-groundnut

intercropping is meagre. Keeping these points in view, this experiment was planned to study the effect of intercropping on suppression of weeds and productivity of sunflower and groundnut during spring season.

### **MATERIALS AND METHODS**

An experiment was conducted during spring seasons of 1996 and 1997 at New Delhi. The treatments comprising 4 cropping systems (monocultures of both sunflower and groundnut and intercropping

of sunflower in uniform rows at 100 cm with 2 rows of groundnut and sunflower in paired rows (40/160) cm with 4 rows of groundnut) as main plots and 4 weed-control measures (weedy check, pre-emergence application of Pendimethalin at 1.0 kg/ha, hand-weeding 35 days after sowing and Pendimethalin + 1 hand-weeding 35 days) as subplots were replicated thrice in split-plot design.

The sunflower hybrid 'MSFH 8' and groundnut cv. 'SG 84' were sown in the first week of March. Monocultures of sunflower and groundnut were grown at 50 cm × 30 cm and 40 cm × 12 cm spacing. In intercropping systems plant spacing was also kept at 30 and 12 cm. Thus plant density of sunflower and groundnut in intercropping systems was 50 and 80% of the respective monocultures.

The soil was sandy loam in texture, low in organic carbon (0.42%) and medium in available P (13.0 kg/ha) and K (218 kg/ha), with pH 7.4. The sole sunflower was fertilized with 80 kg N, 17.4 kg P and 33.2 kg K/ha, while groundnut was fertilized only with 25 kg N and 22 kg P/ha. In intercropping, sunflower was supplied with 40 kg N + 8.7 kg P + 16.6 kg K/ha, and groundnut with 20 kg N and 17.6 kg P/ha, i.e. as per requirement of the 50 and 80% density of the component crops respectively.

## RESULTS AND DISCUSSION

### Effect of weeds

Sole groundnut recorded the maximum weed count and dry weight (Table 1), whereas sole sunflower had the lowest count and dry matter of weeds. Both the

**Table 1.** Effect of intercropping and weed-control measures on weeds count and dry-matter accumulation by weeds

| Treatment                   | Weeds count/m <sup>2</sup><br>(30 DAS) |      | Dry-matter<br>accumulation (90 DAS) (q/ha) |       |
|-----------------------------|----------------------------------------|------|--------------------------------------------|-------|
|                             | 1996                                   | 1997 | 1996                                       | 1997  |
| <i>Intercropping</i>        |                                        |      |                                            |       |
| Sole sunflower              | 114                                    | 204  | 9.73                                       | 13.47 |
| Sunflower + groundnut (1:2) | 130                                    | 231  | 11.38                                      | 15.77 |
| Sunflower + groundnut (2:4) | 135                                    | 208  | 10.30                                      | 14.78 |
| Sole groundnut              | 157                                    | 272  | 14.74                                      | 17.15 |
| CD (P=0.05)                 | 18                                     | 27   | 1.93                                       | 2.13  |
| <i>Weed-control measure</i> |                                        |      |                                            |       |
| Weedy check                 | 231                                    | 341  | 23.67                                      | 27.02 |
| Pendimethalin (P)           | 63                                     | 140  | 10.00                                      | 12.46 |
| Hand-weeding (HW)           | 183                                    | 301  | 8.58                                       | 15.13 |
| P + HW                      | 59                                     | 131  | 3.90                                       | 6.57  |
| CD (P=0.05)                 | 17                                     | 24   | 1.59                                       | 1.83  |

DAS : Days after sowing

intercropping systems being at par suppressed the weed growth compared with sole groundnut.

Weedy check plots recorded the highest density and dry weight of weeds, which was significantly suppressed by pre-emergence application of Pendimethalin. One hand-weeding at 35 days also suppressed the growth of weeds. Combined application of both the weed-control measures proved to be the most effective, as it recorded significantly lower weed dry matter against their individual application.

### **Effect on sunflower**

Sunflower grown at 100 cm in 1:2 ratio of intercropping recorded significantly higher diameter of capitulum, seeds/capitulum and 1,000-seed weight than other systems (Table 2). This was because wider spacing of 100 cm might have offered less competition and made more resources

available to individual crops (Singh, 1998). Contrary to this, the seed yield of sunflower was significantly higher from sole crop. This was only due to lower plant density of sunflower in intercropping systems. Sunflower in uniform rows of 1:2 ratio gave more seed yield than paired rows of sunflower (40/160 cm) because of less competition among plants at 100 cm in 1:2 ratio as supported by the yield attributes. There was yield advantage in 1:2 and 2:4 ratio of intercropping over sole crops as sunflower with 50% density in 2 systems recorded 81 and 65% yield than sole sunflower respectively. This was only because of less competition for resources under reduced density.

All the weed-control measures significantly increased the yield attributes of sunflower over weedy check (Table 2). Pre-emergence application of Pendimethalin + 1 hand-weeding 35 days recorded the high-

**Table 2.** Effect of intercropping and weed-control measures on yield attributes and seed yield of sunflower

| Treatment                   | Diameter of capitulum (cm) |      | Seeds/plant |      | 1,000-seed weight (g) |       | Seed yield (q/ha) |      |
|-----------------------------|----------------------------|------|-------------|------|-----------------------|-------|-------------------|------|
|                             | 1996                       | 1997 | 1996        | 1997 | 1996                  | 1997  | 1996              | 1997 |
| <i>Intercropping</i>        |                            |      |             |      |                       |       |                   |      |
| Sole sunflower              | 15.5                       | 11.9 | 849         | 705  | 34.90                 | 28.50 | 18.4              | 11.8 |
| Sunflower+groundnut (1:2)   | 17.4                       | 14.5 | 1,046       | 854  | 42.75                 | 35.71 | 14.2              | 10.2 |
| Sunflower+groundnut (2:4)   | 15.2                       | 13.6 | 968         | 734  | 35.50                 | 33.16 | 11.3              | 8.7  |
| CD (P=0.05)                 | 0.3                        | 0.2  | 184         | 86   | 4.0                   | 5.10  | 3.5               | 0.8  |
| <i>Weed-control measure</i> |                            |      |             |      |                       |       |                   |      |
| Weedy check                 | 15.1                       | 12.6 | 881         | 695  | 35.80                 | 28.38 | 13.9              | 8.3  |
| Pendimethalin (P)           | 16.0                       | 13.3 | 948         | 764  | 37.90                 | 32.23 | 14.5              | 10.2 |
| Hand-weeding (HW)           | 16.6                       | 13.4 | 961         | 773  | 37.30                 | 32.80 | 15.1              | 10.3 |
| P+HW                        | 16.6                       | 14.1 | 1,027       | 826  | 39.70                 | 35.95 | 15.0              | 12.1 |
| CD (P=0.05)                 | 0.7                        | 0.6  | 42          | 67   | NS                    | 3.47  | 0.6               | 0.7  |

DAS; Days after sowing

est yield attributes in sunflower because of suppression of weed growth, consequently resulting in less competition for natural resources. Pendimethalin and hand-weeding though were equally effective in improving the yield attributes, their combined application significantly improved capitulum size in 1997 and seeds/plant in 1996.

The seed yield was significantly increased by weed-control measures in 2 years (Table 2). The maximum increase in yield was recorded with the combined application of Pendimethalin and 1 hand-weeding however, differences were significant in 1997 only. The significant increase in seed yield with weed-control measures was owing to enhanced yield attributes (Table 2).

#### **Effect on groundnut**

Groundnut in intercropping gave significantly lower yield attributes than sole groundnut (Table 3). Groundnut in 2:4 ratio

recorded significantly higher yield attributes than in 1:2 ratio. This reduction was mainly due to shading effect of sunflower which was comparatively less in 2:4 ratio because of wider (160 cm) spacing between sunflower rows. In this system, groundnut might have utilized more energy and resulted in more production of photosynthates.

An intercropping of groundnut adversely affected the pod yield (Table 3). The lowest yield was recorded in intercropping with sunflower at 100 cm in 1:2 ratio. Reduction in yield in intercropping was due to combined effect of lower density and reduced yield attributes. Groundnut in 2:4 ratio had the advantage of wider spacing (160 cm) between sunflower rows and recorded comparatively better yield than in 1:2 ratio.

Both pre-emergence application of Pendimethalin and 1 hand-weeding were equally effective in enhancing the yield attri-

**Table 3.** Effect of intercropping and weed-control measures on yield attributes and yield of groundnut

| Treatment                    | Pods/<br>plant |      | Developed pods/<br>plant |      | Pod weight/<br>plant (g) |      | Pod yield<br>(q/ha) |      |
|------------------------------|----------------|------|--------------------------|------|--------------------------|------|---------------------|------|
|                              | 1996           | 1997 | 1996                     | 1997 | 1996                     | 1997 | 1996                | 1997 |
| <i>Intercropping</i>         |                |      |                          |      |                          |      |                     |      |
| Sunflower+groundnut (1:2)    | 17.6           | 16.4 | 10.7                     | 9.9  | 4.4                      | 4.0  | 7.0                 | 9.1  |
| Sunflower+groundnut (2:4)    | 20.9           | 18.1 | 12.7                     | 10.7 | 5.8                      | 4.6  | 8.8                 | 7.0  |
| Sole groundnut               | 27.1           | 26.4 | 18.4                     | 16.5 | 9.4                      | 8.4  | 18.7                | 17.0 |
| CD (P=0.05)                  | 3.4            | 3.0  | 2.1                      | 1.6  | 0.3                      | 0.3  | 1.3                 | 0.9  |
| <i>Weed-control measures</i> |                |      |                          |      |                          |      |                     |      |
| Weedy check                  | 13.3           | 10.8 | 6.7                      | 6.3  | 2.7                      | 2.3  | 4.7                 | 4.1  |
| Pendimethalin (P)            | 23.9           | 22.7 | 15.3                     | 13.1 | 7.0                      | 6.2  | 12.4                | 10.8 |
| Hand-weeding (HW)            | 21.5           | 21.1 | 14.9                     | 13.0 | 7.0                      | 5.8  | 12.6                | 10.4 |
| P+HW                         | 29.4           | 26.6 | 18.7                     | 17.1 | 9.3                      | 8.2  | 16.3                | 14.8 |
| CD (P=0.05)                  | 3.0            | 2.7  | 1.5                      | 1.2  | 0.4                      | 0.3  | 1.3                 | 1.1  |

DAS; Days after sowing

butes, but their combined application further increased the yield attributes significantly than individual application (Table 3). This was because of reduced crop-weed competition. Pre-emergence application of Pendimethalin and 1 hand-weeding remained at par but their combined application recorded the maximum pod yield being significantly superior to their individual application.

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