## RESULTS and DISCUSSION

### 1. Heading Date :

Data on the number of days from sowing to heading of rice plants as influenced by varieties and fertilization are shown in Table (1).

### 1.1. Effect of varieties :

Results in Table (1) indicate clearly that there was a significant difference in the number of days from sowing to heading date among the two rice varieties. Giza 172 had the shortest period to heading than IR 1626 in the two successive seasons. It could be concluded that the heading date of rice variety of Giza 172 were 9.37 and 2.38 days earlier than those of IR 1626 variety in the first and second seasons, respectively. Similarly, Abdel-Rahman (1977), Abdulgalil et al. (1979), Ajmer et al., (1979), Okada et al. s(1979), Sinha and Bhattacharyya (1980), Singh and Sharma (1982) and Sanaa (1983), they reported that there was great variation in the varietal response as to heading date.

### 1.2. Effect of fertilization :

Nitrogen and phosphorous fertilization show significant effect on the number of days from sowing to heading in the two successive seasons.

Application of nitrogen alone prolonged the period to heading and the increase in N level was accompanied by a progressive increase in the number of days to heading in both seasons. On the other hand,

**Table (1) :** Effect of variety and fertilization on number of days from sowing to 50 % heading.

| Fertilization treatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 94.75 AB | 104.00 G | 99.38 b | 100 | 92.75 A | 97.00 FG | 94.88 ab | 100 |
| $N_oP_1$ | 94.75 AB | 102.50 EF | 98.63 a | 99 | 93.25 AB | 95.75 EF | 94.50 ab | 100 |
| $N_oP_2$ | 94.00 A | 102.50 EF | 98.25 a | 99 | 94.25 B-D | 95.25 DE | 94.75 ab | 100 |
| $N_1P_o$ | 96.25 C | 104.50 G | 100.38 C | 101 | 94.25 B-D | 97.25 GH | 95.75 bc | 101 |
| $N_1P_1$ | 94.50 AB | 103.50 FG | 99.00 b | 100 | 93.75 A-C | 95.00 C-E | 94.38 a | 99 |
| $N_1P_2$ | 94.00 A | 102.00 E | 98.00 a | 99 | 94.00 A-D | 95.25 DE | 94.63 ab | 100 |
| $N_2P_o$ | 97.50 C | 108.25 HK | 102.88 e | 104 | 95.00 C-E | 98.50 HK | 96.75 c | 102 |
| $N_2P_1$ | 96.25 C | 107.75 H | 102.00 d | 103 | 94.50 B-E | 95.25 DE | 94.88 ab | 100 |
| $N_2P_2$ | 95.00 AB | 103.50 FG | 99.25 b | 100 | 93.75 A-C | 94.75 C-E | 94.25 a | 99 |
| $N_3P_o$ | 98.25 D | 109.25 K | 103.75 e | 104 | 94.25 B-D | 98.25 G-K | 96.25 bc | 101 |
| $N_3P_1$ | 96.75 C | 108.25 HK | 102.50 d | 103 | 94.00 A-D | 99.50 K | 96.75 c | 102 |
| $N_3P_2$ | 95.75 B | 104.25 G | 100.00 c | 101 | 94.75 C-E | 95.25 DE | 95.00 ab | 100 |
| Mean | 95.65 a | 105.02 b | 100.34 | | 94.04 a | 96.42 b | 95.23 | |
| Rel. | 100 | 110 | | | 100 | 103 | | |

the combination of N and P fertilizers significantly reduced the number of days from sowing to heading (Table 1).

It could be concluded that N-fertilizer resulted in delayed heading, while P-fertilizer hastened heading in rice plants in both seasons. These results might be attributed to the effect of nitrogen on the vegetative growth of rice plants. Whereas, the P-fertilizer had good effect on the growth, of rice roots. Thease results are in harmony with those obtained by Hegazy (1974), Abdel-Rahman (1977), Ibrahim et al. (1980) and Sanaa (1983). On the contrary, Raju (1979), showed that N-application reduced number of days to heading date.

**1.3. Effect of the interaction :**

Data presented in Table (1) indicate that the effect of the interaction of variety and fertilization on heading date of rice was significant in the both seasons.

In 1985 season, the highest number of days from sowing to heading date was obtained from IR 1626 variety and 90 kg N/fed. While the lowest number of days to heading was obtained from Giza 172 variety and 48 kg $P_2O_5$/fed.

In 1986 season, the highest number of days from sowing to heading date was obtained from IR/1626with 90 kg N + 24 kg $P_2O_5$/fed. Whereas, the lowest number was obtained from Giza 172 and no fertilization such effect was expected since varieties and fertilization had significant effect on the number of days from sowing to heading date.

## 2. StemLength :

Data on stem length of rice as influenced by varieties and fertilization are shown in Tables (2 and 3).

### 2.1. Effect of varieties :

With regard to varietal effect, data presented in Tables (2 and 3) show that there was a significant effect on stem length at heading as well as at harvesting stage in the two successive seasons. Giza 172 variety produced higher plants that IR 1626 in the both seasons. The difference in stem height between varieties was attributed to difference in the genetical make up. Similar results were obtained by Sarathe et al. (1969), Jogi and Baba (1971), Sun (1070), Singh et al. (1980), Aly et al. (1981), Bhattacharyya and Mishra (1981) and Sanaa (1983).

### 2.2. Effect of fertilization :

Data in Table (2) show that the stem length at heading stage was increased by N and P fertilization. However the increase in stem length of rice plants was not significant in the first season, while in the second season such effect was significant.

At harvesting stage, fertilization with N and P showed significant effect on the stem length of rice plants in the two successive seasons (Table 3). The height of stem significantly increased as nitrogen level increases up to a level of 90 kg/fed. in the first season. Whereas, application of 90 kg N + 48 kg $P_2O_5$/fed. produced higher stem length comarative with the other treatments in the second season (Table 3).

**Table (2) :** Effect of variety and fertilization on stem length at heading stage, in cms.

| Fertilization treatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 70.85 | 51.53 | 61.19 a | 100 | 68.38 | 55.08 | 61.73 a | 100 |
| $N_oP_1$ | 71.35 | 53.38 | 62.37 a | 102 | 78.30 | 57.50 | 67.90 b-e | 110 |
| $N_oP_2$ | 74.28 | 58.98 | 66.63 a | 109 | 73.30 | 57.20 | 65.25 a-c | 106 |
| $N_1P_o$ | 68.70 | 53.58 | 61.14 a | 100 | 71.60 | 55.00 | 63.30 ab | 103 |
| $N_1P_1$ | 71.13 | 55.28 | 63.21 a | 103 | 73.98 | 58.43 | 66.21 a-d | 107 |
| $N_1P_2$ | 72.65 | 52.65 | 62.65 a | 102 | 79.10 | 56.93 | 68.02 b-e | 110 |
| $N_2P_o$ | 67.63 | 56.50 | 62.07 a | 101 | 76.00 | 59.25 | 67.63 b-e | 110 |
| $N_2P_1$ | 72.75 | 55.95 | 64.35 a | 105 | 80.55 | 60.35 | 70.45 d-f | 115 |
| $N_2P_2$ | 73.40 | 52.78 | 63.09 a | 103 | 79.88 | 57.75 | 68.82 c-e | 111 |
| $N_3P_o$ | 75.63 | 55.15 | 65.39 a | 107 | 79.60 | 68.68 | 74.24 f | 120 |
| $N_3P_1$ | 75.28 | 53.30 | 64.29 a | 105 | 81.70 | 58.75 | 70.24 c-f | 114 |
| $N_3P_2$ | 76.15 | 54.63 | 65.39 a | 107 | 81.40 | 63.18 | 72.29 ef | 117 |
| Mean | 72.48 b | 54.48 a | 63.48 | | 76.98 b | 59.00 a | 67.99 | |
| Rel. | 100 | 75 | | | 100 | 77 | | |

**Table (3) :** Effect of variety and fertilization on stem length at harvesting stage, in cms.

| Fertilization treatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 67.78 | 52.00 | 59.89 a | 100 | 69.53 | 56.88 | 63.21 a | 100 |
| $N_oP_1$ | 70.73 | 52.08 | 61.41 a-c | 103 | 75.63 | 57.13 | 66.38 a-d | 105 |
| $N_oP_2$ | 69.68 | 51.90 | 60.78 ab | 101 | 71.13 | 58.50 | 64.82 ab | 103 |
| $N_1P_o$ | 68.60 | 53.40 | 61.00 ab | 102 | 74.25 | 57.00 | 65.63 a-c | 104 |
| $N_1P_1$ | 73.90 | 53.70 | 63.80 ef | 107 | 76.13 | 56.75 | 66.44 a-d | 105 |
| $N_1P_2$ | 73.13 | 51.98 | 62.56 b-e | 104 | 74.25 | 59.88 | 67.07 a-d | 106 |
| $N_2P_o$ | 71.08 | 58.75 | 64.92 ef | 108 | 78.63 | 60.25 | 69.44 c-e | 110 |
| $N_2P_1$ | 72.40 | 54.13 | 63.27 ce | 106 | 82.00 | 58.63 | 70.32 d-e | 111 |
| $N_2P_2$ | 72.58 | 55.33 | 63.96 ef | 107 | 78.38 | 59.50 | 68.94 b-d | 109 |
| $N_3P_o$ | 74.90 | 57.75 | 66.33 g | 111 | 76.50 | 58.75 | 67.63 a-d | 107 |
| $N_3P_1$ | 72.73 | 57.08 | 64.91 ef | 108 | 77.00 | 59.25 | 68.13 b-d | 108 |
| $N_3P_2$ | 75.85 | 55.35 | 65.60 fg | 110 | 86.50 | 60.50 | 73.50 e | 116 |
| Mean | 7195 b | 54.45 a | 63.20 | | 76.66 b | 58.59 a | 67.63 | |
| Rel.. | 100 | 76 | | | 100 | 76 | | |

It could be concluded that application of N and P significantly increased the stem length of rice plants. These results might be attributed to the effect of fertilization in accelerating early vegetative growth (Uemura, 1979), cumulative effect of greater dry mater production (Rai and Murty, 1979), increasing the number and length of internodes of cereal crops (Bucher, 1953 and Moursi et al. (1970). Moreover, Specht (1957) found that protein formation depends on essential elements, especially nitrogen and phosphorous. Therefore, deficiency of N and P hinders plant growth and causes the plants to stunt.

Similar results were optained by Gaballah (1970) Kim and Ha (1971), Hegazy (1974), Abdel-Rahman (1977), Saleh and El-Shoney (1978), Raju (1979), Uemura (1979), Hartley (1980), Ibrahim et al. (1980), Kim et al. (1983) and Sanaa (1983).

### 2.3. Effect of the interaction :

The effect of the interaction between varieties and fertilization on stem length of rice plants was not significant in the two successive seasons (Tables 2 and 3). The effect of varieties on stem length at heading and harvesting stages were apparently not influenced by the application of N and P. On the other hand, the effect of N- and P-fertilizer on the length of stem was not influenced by varieties of rice plants.

## 3. Number of Plants/$m^2$ :

Data on the number of plants/$m^2$ as influenced by varieties and fertilization are shown in Table (4).

### 3.1. Effect of varieties :

Results in Tables (4 and 5) indicate clearly that there were no significant differences in the number of plants/$m^2$ at heading stage as well as at harvesting among the two rice varieties. These results were true in the both seasons. Similar results were obtained by Park et al.s (1978), who reported that the new high-yielding rice varieties have greater tillering ability. Nevertheless, Sarathe et al. (1969) and Oliveira (1982), found high variation between rice varieties in the number of plants/$m^2$.

### 3.2. Effect of fertilization :

Number of plants/$m^2$ were significantly affected to different extents by fertilization with nitrogen and phosphorous in the two successive seasons (Tables 4 and 5).

At heading stage, the highest number of plants/$m^2$ were obtained at the level of 90 kg N/fed., while, the lowest number was obtained by using 24 kg $P_2O_5$ and without nitrogen fertilizer in the first and second seasons, respectively.

Similarly, increasing the levels of N and P up to 90 kg N + 24 kg $P_2O_5$ in the first season and 90 kg N + 48 kg $P_2O_5$ in the second season significantly increased the number of plants/$m^2$ at harvesting stage (Tables 4 and 5).

It could be concluded that application of N and P improved number of plants/$m^2$. These results are logical since N- and P-fertilization

**Table (4) :** Effect of variety and fertilization on number of plants/m² at heading stage.

| Fertilization treatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 265.00 | 347.00 | 306.00 ab | 100 | 301.00 | 336.00 | 318.50 a | 100 |
| $N_oP_1$ | 311.00 | 257.00 | 284.00 a | 93 | 396.00 | 445.00 | 420.50 b | 132 |
| $N_oP_2$ | 277.00 | 363.00 | 320.00 bc | 105 | 398.00 | 504.50 | 451.25 bc | 142 |
| $N_1P_o$ | 401.00 | 341.50 | 371.25 de | 121 | 412.00 | 407.00 | 409.50 b | 129 |
| $N_1P_1$ | 417.00 | 431.00 | 424.00 f | 139 | 451.00 | 422.00 | 436.50 bc | 137 |
| $N_1P_2$ | 339.00 | 350.00 | 344.50 cd | 113 | 465.00 | 475.00 | 470.00 cd | 148 |
| $N_2P_o$ | 420.00 | 343.00 | 381.50 e | 125 | 434.00 | 469.00 | 451.50 bc | 142 |
| $N_2P_1$ | 408.00 | 318.00 | 363.00 de | 119 | 557.00 | 502.00 | 529.50 e | 166 |
| $N_2P_2$ | 366.50 | 316.25 | 341.38 cd | 112 | 478.00 | 484.00 | 481.00 c-e | 151 |
| $N_3P_o$ | 456.00 | 379.50 | 417.75 f | 137 | 522.00 | 534.00 | 528.00 e | 166 |
| $N_3P_1$ | 359.50 | 401.00 | 380.25 e | 124 | 535.00 | 524.00 | 529.50 e | 166 |
| $N_3P_2$ | 404.00 | 378.00 | 391.00 ef | 128 | 490.00 | 529.00 | 509.50 de | 160 |
| Mean | 368.67 a | 352.10 a | 360.39 | | 453.25 a | 469.29 a | 461.27 | |
| Rel. | 100 | 96 | | | 100 | 104 | | |

**Table (5) :** Effect of variety and fertilization on number of plants/$m^2$ at harvesting.

| Fertilization treatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 443.00 | 538.00 | 490.50 ab | 100 | 388.00 | 433.25 | 410.63 a | 100 |
| $N_oP_1$ | 476.00 | 506.00 | 491.00 ab | 100 | 405.00 | 503.00 | 454.00 a | 111 |
| $N_oP_2$ | 450.00 | 476.00 | 463.00 a | 94 | 538.00 | 661.00 | 599.50 c | 146 |
| $N_1P_o$ | 486.00 | 568.00 | 527.00 bc | 107 | 692.00 | 544.00 | 618.00 cd | 151 |
| $N_1P_1$ | 568.00 | 542.00 | 555.00 c | 113 | 649.00 | 549.00 | 599.00 c | 146 |
| $N_1P_2$ | 571.00 | 574.00 | 572.50 c | 117 | 567.00 | 533.00 | 550.00 b | 134 |
| $N_2P_o$ | 540.00 | 585.00 | 562.50 c | 115 | 631.00 | 605.00 | 618.00 cd | 151 |
| $N_2P_1$ | 471.00 | 618.00 | 544.50 c | 111 | 770.00 | 724.00 | 747.00 fg | 182 |
| $N_2P_2$ | 624.00 | 633.00 | 628.50 d | 128 | 710.00 | 584.00 | 647.00 cd | 158 |
| $N_3P_o$ | 614.00 | 657.00 | 635.50 d | 130 | 728.00 | 681.00 | 704.50 ef | 172 |
| $N_3P_1$ | 572.00 | 737.00 | 654.50 d | 133 | 700.00 | 626.00 | 663.00 de | 161 |
| $N_3P_2$ | 588.00 | 690.00 | 639.00 d | 130 | 902.00 | 682.00 | 792.00 g | 193 |
| Mean | 533.58 a | 593.67 a | 563.63 | | 640.00 a | 593.77 a | 616.89 | |
| Rel. | 100 | 111 | | | 100 | 93 | | |

increase the meristemic activity in rice plants. These results are in general agreement with those obtained by Kim and Ha (1971), Saleh and El-Shoney (1978), Raju (1979), Ibrahim et al. (1980) and Kim et al. (1983).

### 3.3. Effect of the interaction :

Data in Tables (4 and 5) show that the effect of the interaction varieties X fertilization on the number of plants/$m^2$ was not significant in the two successive seasons.

## 4. Number of Ear-Bearing Plants/$m^2$ :

Data on the number of ear-bearing plants/$m^2$ as influenced by varieties and fertilization are shown in Table (6).

### 4.1. Effect of varieties :

Results in Table (6) show that the effect of varieties on the number of ear-bearing plants/$m^2$ was not significant in the two successive seasons. These results did not agree with those obtained by Aly et al. (1981), Bhattacharyya and Mishra (1981) and Sanaa (1983). Moreover, Gopalswamy and Rai (1977) found that Java variety had a higher number of effective tillers than cv. IR 8.

### 4.2. Effect of fertilization :

In both seasons, the number of ear-bearing plants/$m^2$ significantly increased with increasing N and P levels. The highest number of ear-bearing plants/$m^2$ produced from application of 90 kg N+ 24 kg $P_2O_5$/fed. (N3 P1) in the first season, and 90 kg N/fed. + 48 kg $P_2O_5$/fed.

**Table (6) :** Effect of variety and fertilization on number of ear-bearing plants/$m^2$.

| Fertilization treatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 401.00 | 482.00 | 441.50 ab | 100 | 300.00 | 385.25 | 342.63 a | 100 |
| $N_oP_1$ | 455.00 | 473.00 | 464.00 bc | 105 | 348.00 | 420.50 | 384.25 a | 112 |
| $N_oP_2$ | 412.00 | 402.00 | 407.00 a | 92 | 470.00 | 508.00 | 489.00 b | 143 |
| $N_1P_o$ | 428.00 | 488.00 | 458.00 bc | 104 | 560.00 | 458.00 | 509.00 bc | 149 |
| $N_1P_1$ | 520.00 | 499.00 | 509.50 c | 115 | 565.00 | 512.00 | 538.50 cd | 157 |
| $N_1P_2$ | 503.00 | 513.00 | 508.00 c | 115 | 496.00 | 471.00 | 483.00 b | 141 |
| $N_2P_o$ | 488.00 | 499.00 | 493.50 c | 112 | 530.00 | 483.00 | 506.50 bc | 148 |
| $N_2P_1$ | 454.00 | 582.00 | 518.00 cd | 117 | 677.00 | 620.00 | 648.50 f | 189 |
| $N_2P_2$ | 596.00 | 544.00 | 570.00 de | 129 | 600.00 | 527.00 | 563.50 de | 164 |
| $N_3P_o$ | 584.00 | 589.00 | 586.50 e | 133 | 669.00 | 631.00 | 650.00 f | 190 |
| $N_3P_1$ | 523.00 | 673.00 | 598.00 e | 135 | 617.00 | 541.00 | 579.00 de | 169 |
| $N_3P_2$ | 542.00 | 615.00 | 578.50 e | 131 | 812.00 | 569.00 | 690.50 f | 202 |
| Mean | 492.17 a | 529.92 a | 511.05 | | 553.67 a | 510.48 a | 532.03 | |
| Rel. | 100 | 108 | | | 100 | 92 | | |

(N3 P2) in the second season (Table 6). These results are expected since N as well as P were essential for the growth and development of the sexual organs of plants. Similar results were obtained by Socorro et al. (1978), Dixit and Singh (1979), Tayebi and Dadaschi (1981) and Sanaa (1983). They reported that application of nitrogen increased the number of productive tillers/plant. In addition, Tripathi and Agrawal (1973), indicated that the application of 120 kg N + 60 kg $P_2O_5$ + 60 kg $K_2O$/ha increased of productive tillers/plant. On contrary, Abdel Rahman (1977), reported that N- application did not influence number of productive tillers/hill.

### 4.3. Effect of the interaction :

Data presented in Table (6) show that the effect of the interaction between varieties and fertilization on the number of ear-bearing plants/$m^2$ was not significant in the two successive seasons.

## 5. Area of Flag Leaf :

Data on the area of flag leaf as influenced by varieties and fertilization are shown in Table (7).

### 5.1. Effect of varieties :

The obtained data in Table (7) indicate clearly that there was no significant differences in the area of flag leaf among rice varieties. In general, Giza 172 had smaller L.A. than IR 1626, but without significant differences. These result was true in the two successive seasons. Such result did not agree with those obtained by Abdulgalil

**Table (7) :** Effect of variety and fertilization on area of flag leaf, in cms².

| Fertilization treatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 21.25 | 30.92 | 26.09 a | 100 | 37.13 | 39.88 | 38.51 a | 100 |
| $N_oP_1$ | 24.35 | 29.28 | 26.82 a | 103 | 36.08 | 45.90 | 40.99 a | 106 |
| $N_oP_2$ | 28.60 | 29.24 | 28.92 a | 111 | 32.58 | 41.65 | 37.12 a | 96 |
| $N_1P_o$ | 21.18 | 29.48 | 25.33 a | 97 | 30.93 | 33.90 | 32.42 a | 84 |
| $N_1P_1$ | 24.53 | 31.84 | 28.19 a | 108 | 34.75 | 35.03 | 34.89 a | 91 |
| $N_1P_2$ | 24.76 | 23.01 | 23.89 a | 92 | 37.65 | 44.50 | 41.08 a | 107 |
| $N_2P_o$ | 25.30 | 32.77 | 29.04 a | 111 | 39.00 | 31.40 | 35.20 a | 91 |
| $N_2P_1$ | 25.77 | 30.33 | 28.05 a | 108 | 43.78 | 38.45 | 41.12 a | 107 |
| $N_2P_2$ | 23.76 | 23.92 | 23.84 a | 91 | 37.95 | 44.35 | 41.15 a | 107 |
| $N_3P_o$ | 25.97 | 30.80 | 28.39 a | 109 | 31.25 | 41.33 | 36.29 a | 94 |
| $N_3P_1$ | 22.39 | 33.03 | 27.71 a | 106 | 30.30 | 49.28 | 39.79 a | 103 |
| $N_3P_2$ | 24.70 | 30.20 | 27.45 a | 105 | 37.88 | 41.95 | 39.92 a | 104 |
| Mean | 24.38 a | 29.57 a | 26.98 | | 35.79 a | 40.64 a | 38.21 | |
| Rel. | 100 | 121 | | | 100 | 113 | | |

et al. (1979). They reported that significant varietal differences was observed regarding the LAI at all the dates of sampling. Sakha 2 and IR 1561 had longer leaf area duration than the other varieties, i.e., Nahda, Giza 171, Giza 172, Cr. 236-2, Yabani 15, Arabi, iR 24, Sakha 1, IR 1628 and Blue belle as they recorded higher L.A.I. Similar conclusion found by Seo and Chamura (1979).

### 5.2. Effect of fertilization :

Application of N and P fertilizers had no significant effect on the leaf area of flag in the two successive seasons. Increases in L.A. due to N and P application were below the level of significant at 5 % (Table 7). On contrary, Abdulgalil et al. (1979), Raju (1979), Kupkanchanakul and Vergara (1980) and Kim et al. (1983), who reported that the leaf area index was greatly influenced by N-fertilization. The fertilized plants had higher LAI than the unfertilized ones.

### 5.3. Effect of the interaction :

The effect of the interaction between rice varieties and fertilization was not significant in the both seasons (Table 7).

## 6. Percentage of Lodging :

Data on the percentage of lodging plants as influenced by varieties and fertilization are shown in Table (8).

### 6.1. Effect of varieties :

Data in Table (8) indicate clearly that percentage of lodging was affected by varietal characteristics. The differences among two

**Table (8) :** Effect of variety and fertilization on lodging percentage of rice plants.

| Fetilization treatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 2.50 | 0.00 | 1.25 a | 100 | 0.00 | 0.00 | 0.00 a | 100 |
| $N_oP_1$ | 2.50 | 0.00 | 1.25 a | 100 | 0.00 | 0.00 | 0.00 a | 100 |
| $N_oP_2$ | 3.75 | 0.00 | 1.88 a | 150 | 0.00 | 0.00 | 0.00 a | 100 |
| $N_1P_o$ | 6.75 | 0.00 | 3.37 ab | 270 | 4.50 | 0.00 | 2.25 b | 225 |
| $N_1P_1$ | 1.75 | 0.00 | 0.87 a | 70 | 5.00 | 0.00 | 2.50 b | 250 |
| $N_1P_2$ | 10.50 | 0.00 | 5.25 ab | 420 | 2.50 | 0.00 | 1.25 ab | 125 |
| $N_2P_o$ | 16.25 | 0.00 | 8.12 bc | 650 | 7.50 | 0.00 | 3.75 bc | 375 |
| $N_2P_1$ | 12.50 | 0.00 | 6.25 b | 500 | 7.50 | 0.00 | 3.75 bc | 375 |
| $N_2P_2$ | 12.50 | 0.00 | 6.25 b | 500 | 10.00 | 0.00 | 5.00 c | 500 |
| $N_3P_o$ | 35.00 | 0.00 | 17.50 e | 1400 | 20.00 | 0.00 | 10.00 d | 1000 |
| $N_3P_1$ | 27.50 | 0.00 | 13.62 de | 1089 | 25.00 | 0.00 | 12.50 de | 1250 |
| $N_3P_2$ | 24.25 | 0.00 | 12.12 cd | 970 | 10.00 | 0.00 | 5.00 c | 500 |
| Mean | 12.94 | 0.00 | 6.47 | | 7.67 | 0.00 | 3.84 | |
| Rel. | 1294 | 100 | | | 767 | 100 | | |

varieties in lodging percentage were significantly confirmed in 1985 and 1986 seasons. Variety of IR 1626 had greater lodging resistance compared with Giza 172 in the both seasons. These results were expected since IR 1626 had a shorter stem length than Giza 172. These results are in harmony with those obtained by Park et al. (1978), Okada et al. (1979) and Hartley (1980).

### 6.2. Effect of fertilization :

Application of nitrogen and phosphorus fertilizers significantly increased the percentage of lodging in the two successive seasons. Higher lodging percentage of rice plants produced from application of 90 kg. N/fed. in the first season and 90 kg. N + 24 kg $P_2O_5$/fed. (N3 P1) in the second season. These result might be attributed or due to the effect of fertilizer in increasing plant height of rice plants for two varieties and this was accompanied by an increase in lodging in the standard variety (Giza 172), but no lodging occurred even at the highest N level in the new dwarf varieties (IR 1626).

### 6.3. Effect of the interaction :

Results in Table (8) indicate that percentage of lodging was not significantly influenced by the effect of the interaction between varieties and fertilization in the both seasons.

## 7. Panicle Length :

Data on panicle length of rice plants as influenced by varieties and fertilization are show in Table (9).

**Table (9) :** Effect of variety and fertilization on panicle length, in cm.

| Fertilization treatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 24.08 | 21.93 | 23.01 a | 100 | 25.88 | 20.88 | 23.38 a | 100 |
| $N_oP_1$ | 25.93 | 22.38 | 24.16 a | 105 | 24.00 | 22.50 | 23.25 a | 99 |
| $N_oP_2$ | 26.73 | 22.28 | 24.51 a | 107 | 24.88 | 22.13 | 23.51 a | 101 |
| $N_1P_o$ | 24.08 | 21.28 | 22.68 a | 99 | 23.75 | 20.38 | 22.07 a | 94 |
| $N_1P_1$ | 25.75 | 23.93 | 24.84 a | 108 | 23.50 | 21.63 | 22.57 a | 97 |
| $N_1P_2$ | 26.38 | 21.75 | 24.07 a | 105 | 23.00 | 22.75 | 22.88 a | 98 |
| $N_2P_o$ | 25.23 | 21.80 | 23.52 a | 102 | 23.25 | 21.25 | 22.25 a | 95 |
| $N_2P_1$ | 24.88 | 19.95 | 22.42 a | 97 | 27.75 | 21.63 | 24.69 a | 106 |
| $N_2P_2$ | 25.78 | 20.38 | 23.08 a | 100 | 25.65 | 22.00 | 23.83 a | 102 |
| $N_3P_o$ | 24.65 | 21.15 | 22.90 a | 100 | 24.63 | 20.38 | 22.51 a | 96 |
| $N_3P_1$ | 25.03 | 21.65 | 23.34 a | 101 | 24.63 | 21.25 | 22.94 a | 98 |
| $N_3P_2$ | 25.63 | 20.68 | 23.16 a | 101 | 25.50 | 22.75 | 24.13 a | 103 |
| Mean | 25.35 b | 21.60 a | 23.48 | | 24.70 b | 21.63 a | 23.17 | |
| Rel. | 100 | 85 | | | 100 | 88 | | |

### 7.1. Effect of varieties :

Results in Table (9) show that varieties exhibited significant effects on panicle length of rice plant in the two successive seasons. Giza 172 produced significantly longer panicles than variety of IR 1626. The differences in length of panicle between varieties is attributed to difference in the gentical make-up. Similarly, Sarathe et al. (1969), Jogi and Baba (1971), Ajmer et al. (1979), Sinha and Bhattacharyya (1980), Aly et al. (1981) and Sanaa (1983), who reported that there was a great variation in panicle length among rice varieties.

### 7.2. Effect of fertilization :

Nitrogen and phosphorus fertilizers had no significant effect on the length of panicle in 1985 and 1986 seasons (Table 9). The effect of fertilization on panicle length of rice plants was studied by many investigators. Abdel Rahman (1977) and Sanaa (1983), found that panicle length did not increase significantly in NP treated plots. On the other hand, Ghaballah (1970), Tripathi and Agrawal (1973), Hegazy (1974), Dixit and Singh (1979) and Raju (1979), reported that panicle length increased significantly by the application of nitrogen and phosphorus fertilizer.

### 7.3. Effect of the interaction :

The effect of the interaction between varieties and fertilization with N and P was not significant on the length of panicle in the two successive seasons (Table 9).

## 8. Panicle Weight :

Data on weight of panicle as influenced by varieties and fertilization are shown in Table (10).

### 8.1. Effect of varieties :

The results in Table (10) show that varieties showed no significant effect on the panicle weight. All differences between varieties in these character were not significant in 1985 and 1986 seasons. These result did not agree with those obtained by Aly et al. (1981), Bhattacharyya and Mishra (1981) and Sanaa (1983). They found that high variation between rice varieties in the weight of panicle.

### 8.2. Effect of fertilization :

Effect of application of N and P fertilizers on the panicle weight of rice plants showed seasonal variation.

In 1985, fertilization did not show significant effect on the weight of panicle, where the differences in panicle weight failed to reach the significant level at 5 % (Table 10).

In 1986, panicle weight significantly increased as fertilizer level increased up to 30 kg N + 24 kg $P_2O_5$/fed. (N1P1), while a higher levels of fertilizer significantly decreased weight of panicle compare with previous treatment.

It could be concluded that fertilization with nitrogen and phosphorus significantly increased the panicle weight in one season only. Similar conclusion observed by Kim et al. (1983) and Sanaa (1983).

**Table (10) :** Effect of variety and fertilization on weight of panicle, in g.

| Fertilization treatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 2.62 | 2.25 | 2.44 a | 100 | 2.48 | 2.05 | 2.27 ce | 100 |
| $N_oP_1$ | 2.82 | 2.28 | 2.55 a | 105 | 2.35 | 2.70 | 2.53 fg | 111 |
| $N_oP_2$ | 2.41 | 2.55 | 2.48 a | 102 | 2.20 | 2.68 | 2.44 e-g | 107 |
| $N_1P_o$ | 2.29 | 2.41 | 2.35 a | 96 | 2.40 | 2.60 | 2.50 fg | 110 |
| $N_1P_1$ | 2.48 | 2.52 | 2.50 a | 102 | 2.80 | 2.80 | 2.80 h | 123 |
| $N_1P_2$ | 2.48 | 2.48 | 2.48 a | 102 | 2.25 | 2.98 | 2.62 gh | 115 |
| $N_2P_o$ | 2.49 | 2.39 | 2.44 a | 100 | 2.30 | 2.40 | 2.35 c-f | 104 |
| $N_2P_1$ | 2.42 | 2.21 | 2.32 a | 95 | 2.08 | 2.43 | 2.26 ce | 100 |
| $N_2P_2$ | 2.12 | 2.52 | 2.32 a | 95 | 2.03 | 2.28 | 2.16 bc | 95 |
| $N_3P_o$ | 2.42 | 2.21 | 2.32 a | 95 | 2.35 | 2.30 | 2.33 c-f | 103 |
| $N_3P_1$ | 2.25 | 2.35 | 2.30 a | 94 | 2.15 | 1.80 | 1.98 ab | 87 |
| $N_3P_2$ | 2.36 | 2.56 | 2.46 a | 101 | 1.45 | 2.23 | 1.84 a | 81 |
| Mean | 2.43 a | 2.39 a | 2.41 | | 2.24 a | 2.44 a | 2.34 | |
| Rel. | 100 | 98 | | | 100 | 109 | | |

### 8.3. Effect of the interaction :

The effect of the interaction between varieties and fertilization on the panicle weight was not significant in the two successive seasons (Table 10).

## 9. Number of Grains per Panicle :

Data on number of grains per panicle as influenced by varieties and fertilization are shown in Table (11).

### 9.1. Effect of varieties :

Data percented in Table (11) indicate that rice varieties showed slight effect on the number of grains/panicle. Seasonal variation in the effect of variety was also observed.

In the first season, the number of grains/panicle were not significantly affect by varieties of rice plants. On the other hand, IR 1626 variety surpassed significantly than Giza 172 in the second season. Similar results were obtained by Sarathe et al. (1969), Jogi and Baba (1971) and Bhattacharyya and Mishra (1981). They found that highly significant differences were dected among rice varieties for number of grains/panicle.

### 9.2. Effect of fertilization :

In the both seasons, application of nitrogen and phosphorus had no significant effect on the number of grains/panicle. These result did not agree with those obtained by Gaballah (1970), Pandey and Sinha (1971), Reddy et al. (1971) and Tayebi and Dadaschi (1981). They reported

**Table (11) :** Effect of variety and fertilization on number of grains/panicle.

| Fertilization treatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 104.02 | 115.17 | 109.60 a | 100 | 103.35 | 122.40 | 112.88 a | 100 |
| $N_oP_1$ | 126.60 | 127.15 | 126.88 a | 116 | 113.23 | 121.25 | 117.47 a | 104 |
| $N_oP_2$ | 95.00 | 124.03 | 109.52 a | 100 | 115.98 | 124.65 | 120.32 a | 107 |
| $N_1P_o$ | 102.50 | 121.75 | 112.13 a | 102 | 103.45 | 122.98 | 113.22 a | 100 |
| $N_1P_1$ | 113.90 | 141.48 | 127.69 a | 117 | 102.68 | 146.18 | 124.43 a | 110 |
| $N_1P_2$ | 113.78 | 121.43 | 117.61 a | 107 | 91.08 | 118.63 | 104.86 a | 93 |
| $N_2P_o$ | 116.83 | 139.03 | 127.93 a | 117 | 65.70 | 109.75 | 87.73 a | 78 |
| $N_2P_1$ | 118.73 | 133.78 | 126.26 a | 115 | 83.78 | 112.93 | 98.36 a | 87 |
| $N_2P_2$ | 107.60 | 127.38 | 117.49 a | 107 | 111.83 | 113.35 | 112.59 a | 100 |
| $N_3P_o$ | 114.13 | 116.75 | 115.42 a | 105 | 110.18 | 149.25 | 129.72 a | 115 |
| $N_3P_1$ | 117.75 | 119.90 | 118.83 a | 108 | 102.18 | 131.33 | 116.76 a | 103 |
| $N_3P_2$ | 114.15 | 136.30 | 125.23 a | 114 | 106.30 | 116.00 | 111.15 a | 98 |
| $N_3P_2$ | 114.15 | 136.30 | 125.23 a | 114 | 106.30 | 116.00 | 111.15 a | 98 |
| Mean | 112.08 a | 127.01 a | 119.55 | | 100.81 a | 124.06 b | 112.46 | |
| Rel. | 100 | 113 | | | 100 | 123 | | |

that the number of grains/panicle were also favourably affected with nitrogen application.

### 9.3. Effect of the interaction :

Results in Table (11) show that the effect of the interaction on the number of grains/panicle was not significant in the both seasons. All differences failed to reach the significant level at 5 %.

## 10. Weight of Grains per Panicle :

Data on the weight of grains/panicle as influenced by varieties and fertilization are shown in Table (12).

### 10.1. Effect of varieties :

Data presented in Table (12) indicate clearly that rice varieties had no significant effect in the weight of grains/panicle. These results were true in the both seasons. These results are expected, since the differences among two varieties in panicle weight were not significantly confirmed in 1985 and 1986 seasons.

### 10.2. Effect of fertilization :

The available results show that the response of this character to application of nitrogen and phosphorus was very similar to previous character, i.e., panicle weight. This finding hold fairly true for the two seasons (Table 12).

Effect of fertilization on weight of grains/panicle of rice plants showed seasonal variations. In 1985, N and P fertilizers did not

**Table (12) :** Effect of variety and fertilization on weight of grains per panicle, in g.

| Fertilization treatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 2.50 | 2.08 | 2.29 a | 100 | 1.86 | 1.91 | 1.89 b-d | 100 |
| $N_oP_1$ | 2.65 | 2.13 | 2.39 a | 104 | 1.77 | 2.07 | 1.92 c-e | 102 |
| $N_oP_2$ | 2.23 | 2.33 | 2.28 a | 100 | 2.00 | 2.05 | 2.03 de | 107 |
| $N_1P_o$ | 2.18 | 2.22 | 2.20 a | 96 | 2.01 | 2.20 | 2.11 ef | 112 |
| $N_1P_1$ | 2.33 | 2.29 | 2.31 a | 101 | 2.43 | 2.19 | 2.31 f | 122 |
| $N_1P_2$ | 2.33 | 2.17 | 2.25 a | 98 | 2.22 | 1.84 | 2.03 de | 107 |
| $N_2P_o$ | 2.35 | 2.21 | 2.28 a | 100 | 1.71 | 1.71 | 1.71 ab | 90 |
| $N_2P_1$ | 2.29 | 2.04 | 2.17 a | 95 | 1.97 | 1.78 | 1.88 b-d | 99 |
| $N_2P_2$ | 1.99 | 2.32 | 2.16 a | 94 | 1.80 | 2.03 | 1.92 c-e | 102 |
| $N_3P_o$ | 2.32 | 2.04 | 2.18 a | 95 | 1.78 | 1.78 | 1.78 bc | 94 |
| $N_3P_1$ | 2.11 | 2.20 | 2.16 a | 94 | 1.85 | 1.64 | 1.75 a-c | 93 |
| $N_3P_2$ | 2.27 | 2.37 | 2.32 a | 101 | 1.35 | 1.74 | 1.55 a | 82 |
| Mean | 2.30 a | 2.20 a | 2.25 | | 1.90 a | 1.91 a | 1.91 | |
| Rel. | 100 | 96 | | | 100 | 101 | | |

show significant effect on weight of grains/panicle, where the all differences failed to reach the significant level at 5 %. On the other hand, increasing level of nitrogen and phosphorus up to 30 kg N + 24 kg $P_2O_5$/ fed. (N1P1) significantly increased the weight of grains/panicle compared with some fertilization treatments. It was observed that further application of N and P fertilizers decreased the weight of grains/panicle.

It could be concluded that application of N and P fertilizers showed significant effect on the weight of grains/panicle in the second season only. Maximum significant increase in the weight of grains /panicle was obtained by applying 30 kg N + 24 $P_2O_5$/fed. in 1986 season. These results might be attributed to the significant effect of fertilization on the weight of panicle. These results are in general agreement with those obtained by Hegazy (1974).

### 10.3. effect of the interaction :

The effect of the interaction between varieties and fertilization on the weight of grains/panicle was not significant in 1985 and 1986 seasons.

## 11. Weight of 1000Grains :

Data on the weight of 1000 grains as influenced by varieties and fertilization are shown in Table (13).

### 11.1. Effect of varieties :

Rice varieties showed signsificant effect on the weight of 1000-grain only in the first season.

**Table (13) :** Effect of variety and fertilization on the weight of 1000 grains, in g.

| Fertilization streatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 26.21 | 21.51 | 23.86 a | 100 | 26.50 | 27.50 | 27.00 a | 100 |
| $N_oP_1$ | 26.84 | 21.43 | 24.14 a | 101 | 30.50 | 28.13 | 29.32 a-c | 109 |
| $N_oP_2$ | 26.32 | 24.89 | 25.61 a | 107 | 28.00 | 29.00 | 28.50 ab | 106 |
| $N_1P_o$ | 26.65 | 22.21 | 24.43 a | 102 | 29.63 | 30.00 | 29.82 b-d | 110 |
| $N_1P_1$ | 25.04 | 22.14 | 23.59 a | 99 | 30.00 | 29.13 | 29.57 b-d | 110 |
| $N_1P_2$ | 26.08 | 23.38 | 24.73 a | 104 | 30.25 | 29.75 | 30.00 b-d | 111 |
| $N_2P_o$ | 25.34 | 21.65 | 23.50 a | 98 | 30.50 | 30.13 | 30.32 cd | 112 |
| $N_2P_1$ | 27.37 | 23.02 | 25.20 a | 106 | 26.50 | 26.50 | 26.50 a | 98 |
| $N_2P_2$ | 26.25 | 23.28 | 24.77 a | 104 | 29.50 | 29.75 | 29.63 b-d | 110 |
| $N_3P_o$ | 28.75 | 21.93 | 25.34 a | 106 | 27.75 | 27.38 | 27.57 ab | 102 |
| $N_3P_1$ | 23.73 | 22.41 | 23.07 a | 97 | 30.50 | 27.88 | 29.19 ab | 109 |
| $N_3P_2$ | 26.45 | 21.28 | 23.87 a | 100 | 29.13 | 32.25 | 30.69 d | 114 |
| Mean | 26.25 b | 22.43 a | 24.34 | | 29.06 a | 28.95 a | 29.01 | |
| Rel. | 100 | 85 | | | 100 | 100 | | |

In 1985 season, Giza 172 surpassed significantly the IR 1626 variety in the weight of 1000 grains. Since, variety of Giza 172 produced gredatest weight of 1000-grain, whereas IR 1626 produced the lowest values. While, variety of rice had no significant effect on the 1000 grains weight in the second season (Table 13).

It could be concluded that rice varieties exhibited significant effect on the weight of 1000 grains in one season only. Similar conclusion observed by Sarathe et al. (1969), Jogi and Baba (1971), Park et al. (1978), Ajmer et al. (1979)à, Aly et al. (1981), Singh and Sharna (1982) and Sanaa (1983). They reported that the weight of 1000 grains character differed among various rice varieties. In addition, Abdel Naby (1980) found that Giza 171 had lower value of 1000-grain (27.84 g.) as compared with those of Giza 159 (29.84 g.) and Giza 172d (28.58 g.).

**11.2. Effect of fertilization :**

Results in Table (13) indicate that application of N and P showed significant effect on the weight of 1000-grain. Seasonal variation in the effect of fertilization was also observed.

In the first season, the effect of N and P on the 1000-grain weight was not significant. On the other hand, weight of 1000-grain significantly increased as levels of N and P increased up to 90 kg N + 48 kg $P_2O_5$/fed. over some fertilizer treatment in the second season (Table 13).

It could be concluded that fertilization had significant effect on the weight of 1000 grains. Maximum significant increase was obtained

by applying 90 kg N + 48 kg $P_2O_5$.

The effect of fertilization on the 1000 grains weight of rice was studied by many investigators. Kaupkanchanakul and Vergara (1980), Youssef et al. (1980) and Sanaa (1983) found that the weight of 1000 grains did not increase significantly in nitrogen treated plots. Whereas, Gaballah (1970) reported that 1000-grain weight was influenced by increasing N levels in one season, only. On the other hand, Pandey and Sinha (1971), Hegazy (1974), Rethinam (1974), Kaju (1979) and Tayebi and Dadasch (1981) found that weight of 1000 grains significantly increased by the application of nitrogen fertilizer. Moreover, Tripathi and Agrawal (1973) indicated that the application of 120 kg N + 60 kg $P_2O_5$ + 60 kg $K_2O$/ha increased the 1000-grain weight of rice.

### 11.3. Effect of the interaction :

The effect of the interaction between varieties and fertilization on the weight of 1000 grains was not significant in the two successive seasons (Table 13).

## 12. Grain Yield per Feddan :

Data on the grain yield per fed. as influenced by varieties and fertilization are shown in Table (14).

### 12.1. Effect of varieties :

Results in Table (14) indicate clearly that rice varieties did not show any significant effect on the grain yield/fed. of rice plants in the two successive seasons.

**Table (14) :** Effect of vareity and fertilization on grain yield/fed., in kg.

| Fertilization treatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 2095 | 1908 | 2002 a | 100 | 1040 | 1490 | 1265 a | 100 |
| $N_oP_1$ | 2785 | 2309 | 2547 cd | 127 | 2040 | 1841 | 1940 b | 153 |
| $N_oP_2$ | 2567 | 2891 | 2729 de | 136 | 2549 | 3309 | 2929 e | 232 |
| $N_1P_o$ | 2076 | 2528 | 2302 b | 115 | 2558 | 2689 | 2624 c | 207 |
| $N_1P_1$ | 2905 | 2273 | 2589 cd | 129 | 3209 | 3060 | 3135 f | 248 |
| $N_1P_2$ | 2913 | 2787 | 2850 e | 142 | 3226 | 2348 | 2787 d | 220 |
| $N_2P_o$ | 2709 | 2188 | 2449 bc | 122 | 2724 | 3211 | 2968 e | 235 |
| $N_2P_1$ | 3445 | 3169 | 3307 fg | 165 | 4111 | 3199 | 3655 h | 289 |
| $N_2P_2$ | 3523 | 3274 | 3399 gh | 170 | 3984 | 4133 | 4059 k | 321 |
| $N_3P_o$ | 3311 | 3001 | 3156 f | 158 | 3286 | 3465 | 3376 g | 267 |
| $N_3P_1$ | 2866 | 3532 | 3199 fg | 160 | 3485 | 3542 | 3514 gh | 278 |
| $N_3P_2$ | 3529 | 3521 | 3525 h | 176 | 4068 | 4229 | 4149 k | 328 |
| Mean | 2894 a | 2782 a | 2838 | | 3023 a | 3043 a | 3033 | |
| Rel. | 100 | 96 | | | 100 | 101 | | |

In 1985, the grain yields of rice were 2894 (100 %) and 2782 (96 %) kg/fed. for Giza 172 and IR 1626, respectively. The differences between among two varieties failed to reach the significant level at 5 %. Similar results were obtained in the second season, the relative yields were 100 and 101 % for varieties of Giza 172 and IR 1626, respectively (Table 14).

It could be concluded that grain yield of rice was not significantly affected with different varieties. These results are expected since rice varieties showed no significant effect on the yield contributing characters like number of ear-bearing plants/$m^2$, panicle weight and weight of grains/panicle. These results did not agree with those obtained by Dixit and Singh (1979)l, Aly et al. (1980), Russo (1980), Aly et al. (1981), Peeran and Anadam (1982), Sanaa (1983) and Chao (1985). They reported that grain yield of rice differed among various rice significantly.

## 12.2. Effect of fertilization :

The grain yield of rice was greatly influenced by application of nitrogen and phosphorus fertilizers. In the two seasons, the grain yield significantly increased as N and P levels increased.

In 1985, the grain yield significantly increased as the level of fertilizers increased till the rate of 60 kg N + 48 kg $P_2O_5$ /fed. (N2P2). The highest level of N and P did not result in further significant yield increase. The maximum grain yield was obtained from application of 90 kg N + 48 kg $P_2O_5$ (N3P2) and 60 kg N + 48 kg $P_2O_5$/fed. (N2P2)l since, the application of previous treatments significantly increased the grain yield by 76 and 70 % over the control, respectively (Table 14).

Similarly in 1986 season, the same previous levels of N and P resulted in significant in relative grain yields over the control treatment amounting to 228 and 221 %. By the application of 0, 60 kg N + 48 kg $P_2O_5$ and 90 kg N + 48 kg $P_2O_5$/fed. grains of 1265, 4059 and 4149 kg/fed. yield were obtained (Table 14).

It could be concluded that fertilization with nitrogen and phosphorus showed significant effect in increasing the grain yield of rice. Maximum grain yield was obtained by applying 60 kg N or 90 kg N + 48 kg $P_2O_5$ in the both seasons. However, the difference between 60 kg N + 48 kg $P_2O_5$ and 90 kg N + 48 kg $P_2O_5$/fed. was below the level of signsificance. These results reveal that the grain yield/fed. was greatly influenced by number of ear-bearing plants/$m^2$ and weight of 1000-grain regardless the decreases in the weight of panicle as well as the grains weight/panicle resulted from increasing fertilizer levels. Similar conclusion was obtained by Dhattacharyyaand Chatterjee (1978), they reported that early tillering and panicle emergence of rice plants grown on alluvial soil low in N and P were favoured by the application of P with N. Early tillers contributed more to yield than the late ones. They added that early tillers gave more panicle-bearing tillers, higher percentages of filled grains and higher test weight than the late tillers.

Similar results were obtained by Chauhan et al. (1978), Khan et al. (1978), Mandai and Sahu (1978), Prasad and Rathi (1978), Dixit and Singh (1979)l, Raju (1979), Singh and Sharma (1979), Uemura (1979), Aly et al. (1980), Peeran and Anandam (1982), Sanaa (1983), Leilah and El-Kalla (1987), Abd El-Kawy (1987) and Hamissa et al. (1987 a ).

All these investigators found that nitrogen and phosphorus caused significant increase in the grain yield of rice. Moreover, Bhuiya et al. (1979) found that application of P had no significant effect when applied alone but increased yields when applied with 30 kg N/ha. While, Ittyavirah et al. (1979), reported that application of N alone produced progressive decreases in yield and the plants showed P deficiency symptoms. On the other hand, Abdel Rahman (1977), Halm and Dartey (1977) and Mahatim et al. (1979), found that N and P application did not influence grain yield of rice plants.

### 12.3. Effect of the interaction :

Data presented in Table (14) show clearly that the effect of the interaction between varieties and fertilization on the grain yield of rice was not significant in the two seasons. Such result indicates that each experimental factor acted separately in affecting the yield of rice. Similar results were obtained by Gaballah (1970).

## 13. Weight of Straw per Feddan :

Data on the straw yield of rice per feddan as influenced by varieties and fertilization are shown in Table (15).

### 13.1. Effect of varieties :

Rice varieties showed significant effect on the straw yield/fed. only in the first one season, while in the second season differences in the yield of straw failed to reach the significant level at 5 % (Table 15).

**Table (15):** Effect of variety and fertilization on straw yield/fed., in kg.

| Fertilization treatments | 1985 Season | | Mean | Rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 1633 | 1329 | 1481 a | 100 | 2127 | 1801 | 1964 a | 100 |
| $N_oP_1$ | 2156 | 1846 | 2001 b | 135 | 3645 | 3774 | 3710 bc | 189 |
| $N_oP_2$ | 2462 | 2140 | 2301 c | 155 | 3949 | 4084 | 4017 de | 205 |
| $N_1P_o$ | 1830 | 1909 | 1870 b | 126 | 3595 | 3528 | 3562 b | 181 |
| $N_1P_1$ | 2627 | 1913 | 2270 c | 153 | 3832 | 3407 | 3670 bc | 187 |
| $N_1P_2$ | 2664 | 2058 | 2361 c | 159 | 40470 | 3777 | 3924 cd | 200 |
| $N_2P_o$ | 2489 | 1978 | 2234 c | 151 | 3812 | 3988 | 3900 cd | 199 |
| $N_2P_1$ | 3162 | 2704 | 2933 d | 198 | 3898 | 4913 | 4406 f | 224 |
| $N_2P_2$ | 3463 | 2730 | 3097 de | 209 | 4174 | 4302 | 4238 ef | 216 |
| $N_3P_o$ | 3164 | 2624 | 2894 d | 195 | 4318 | 4478 | 4398 f | 224 |
| $N_3P_1$ | 2942 | 3412 | 3177 ef | 215 | 5153 | 3412 | 4283 ef | 218 |
| $N_3P_2$ | 3733 | 3057 | 3395 f | 229 | 4868 | 4997 | 4933 g | 251 |
| Mean | 2694 b | 2308 a | 2501 | | 3962 a | 3872 a | 3917 | |
| Rel. | 100 | 86 | | | 100 | 98 | | |

In 1985 season, varieties differed significantly in the weight of straw/fed. It is obvious that Giza 172 revealed a significant superiority in straw yield compared with rice variety of IR 1626. On the contrary, rice varieties had no significant effect on the weight of straw/fed., the straw yield/fed. was 3962 kg. for Giza 172 and 38 72 kg for IR 1626, without significant differences (Table 15).

In conclusion, rice varieties showed seasonal difference in their effect on the yield of straw. Only in one season the effect was significant where Giza 172 was superior to other variety in affecting the straw yield of rice. The superiority of Giza 172 might have been due to higher rice plants and more number of plants/$m^2$.

**13.2. Effect of fertilization :**

Data presented in Table (15) show that N and P application had significant effect on the straw yield/fed. in the two successive seasons.

In 1985, the yield of straw significantly increased as levels of fertilizers increased up to 90 kg N + 24 kg $P_2O_5$ (N3P1). The highest level of fertilizers did not result in further significant yield increase. Whereas, the straw yield/fed. significantly increased with increasing levels of fertilizers up to higher level (N3P2). All differences between higher level and other fertilizer treatments were significant at 5 %. These results are logical since fertilization significantly increased stem height, number of plants/$m^2$ and number of ear-bearing plants/$m^2$. These results were in harmony with results, obtained by Panda and Leeuwrik (1972) and Khan et al. (1978).

### 13.3. Effect of the interaction :

The effect of the interaction between varieties and fertilization on the straw yield was not significant in the two successive seasons (Table 15).

## 14. Brown Rice Percentage :

Data of brown rice percentages as influenced by varieties and fertilization are shown in Table (16).

### 14.1. Effect of varieties :

Results in Table (16) show that the two varieties differed significantly in the brown rice percentage in the two successive seasons. Giza 172 produced significantly higher percentage than IR 1626. These results were expected since the variety IR 1626 has longer grains as compared with Giza 172.

The difference in brown rice percentages between varieties is attributed to differences in the gentical make-up. Similar results were obtained by Taira et al. (1979). In addition, Abdel Naby (1980) reported that variations in milling products, due to cultivars, where generally more pronounced than those due to planting locations. Thus, hull, brown rice and total white rice percentages were 18.28, 81.71 and 70.64 (for Giza 159), 16.75, 83.25 and 74.74 (for Giza 171) and 18.01, 81.99 and 73.20 (for Giza 172), respectively. Moreover, Youssef et al. (1980) found that IR 579 variety was significantly lower in brown rice percentage compared with the two local varieties, i.e., Giza 159 and Giza 170.

**Table (16) :** Effect of variety and fertilization on the brown rice percentage.

| Fertilization treatments | 1985 Season | | Mean | rel. | 1986 Season | | Mean | Rel. |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | | | Giza 172 | IR 1626 | | |
| $N_oP_o$ (Control) | 82.98 | 78.98 | 80.98 a | 100 | 82.40 | 80.00 | 81.20 a | 100 |
| $N_oP_1$ | 82.53 | 80.14 | 81.34 a | 100 | 82.88 | 78.88 | 80.88 a | 100 |
| $N_oP_2$ | 84.58 | 80.84 | 82.71 a | 102 | 83.00 | 80.75 | 81.88 a | 101 |
| $N_1P_o$ | 83.99 | 80.12 | 82.06 a | 101 | 82.48 | 78.72 | 80.60 a | 99 |
| $N_1P_1$ | 83.14 | 78.75 | 80.95 a | 100 | 82.66 | 80.55 | 81.61 a | 101 |
| $N_1P_2$ | 86.76 | 70.29 | 78.53 a | 97 | 82.70 | 75.94 | 79.32 a | 98 |
| $N_2P_o$ | 83.34 | 80.27 | 81.81 a | 101 | 84.90 | 81.00 | 82.95 a | 102 |
| $N_2P_1$ | 83.09 | 79.26 | 81.18 a | 100 | 82.52 | 80.75 | 81.64 a | 101 |
| $N_2P_2$ | 82.93 | 80.06 | 81.50 a | 101 | 85.00 | 76.98 | 80.99 a | 100 |
| $N_3P_o$ | 82.55 | 79.59 | 81.07 a | 100 | 82.90 | 81.04 | 81.97 a | 101 |
| $N_3P_1$ | 83.00 | 80.00 | 81.50 a | 101 | 82.75 | 79.00 | 80.88 a | 100 |
| $N_3P_2$ | 82.90 | 78.90 | 80.90 a | 100 | 83.90 | 80.90 | 82.40 a | 101 |
| Mean | 83.48 b | 78.93 a | 81.21 | | 83.19 b | 79.54 a | 81.36 | |
| Rel. | 100 | 95 | | | 100 | 96 | | |

### 14.2. Effect of fertilization :

In both seasons, application of N and P showed no significant effect on brown rice percentage. Results of the two successive seasons confirm this conclusion. These result might be attributed to the fact that brown rice percentage is a genetical character which is not affected by environmental conditions. These results agree with those obtained by Youssef et al. (1980), who reported that there were non-significant effects for different N levels on hull percentage.

### 14.3. Effect of the interaction :

The effect of the interaction between varieties and fertilization on brown rice percentage was not significant in the two successive seasons (Table 16).

## 15. Chemical Content :

Data of chemical content of rice plants as affected by varieties and fertilization are shown in Tables (17 and 18).

### A. Nitrogen Content :

### 15.1. Effect of varieties :

Data presented in Table (17) show that rice varieties had no significant effect on the nitrogen content of flag leaf at heading stage. On the other hand, the varieties tested differed significantly in the percentage of N of grains at harvesting (Table 18). Giza 172 revealed a significant superiority in N % as well as protein content of grains followed by IR-1626. It could be concluded that the total crude protein

**Table (17) :** Effect of variety and fertilization on the chemical content of flag leaf at heading stage in 1986 season.

| Fertilization treatments | N % | | | | P % | | | |
|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | Mean | Rel. | Giza 172 | IR 1626 | Mean | Rel. |
| $N_oP_o$ (Control) | 1.120 | 1.112 | 1.120 b | 100 | 0.550 | 0.570 | 0.560 cd | 100 |
| $N_oP_1$ | 0.910 | 0.980 | 0.945 a | 84 | 0.663 | 0.775 | 0.719 e | 128 |
| $N_OP_2$ | 0.770 | 1.185 | 0.978 a | 87 | 0.700 | 0.763 | 0.732 e | 131 |
| $N_1P_o$ | 1.295 | 1.400 | 1.348 c | 120 | 0.625 | 0.488 | 0.557 cd | 99 |
| $N_1P_1$ | 1.470 | 1.225 | 1.348 c | 120 | 0.650 | 0.500 | 0.575 d | 103 |
| $N_1P_2$ | 1.260 | 1.330 | 1.295 c | 116 | 0.650 | 0.538 | 0.594 d | 106 |
| $N_2P_o$ | 1.715 | 1.645 | 1.680 d | 150 | 0.538 | 0.413 | 0.476 b | 85 |
| $N_2P_1$ | 1.820 | 1.575 | 1.698 d | 152 | 0.550 | 0.413 | 0.482 b | 86 |
| $N_2P_2$ | 1.715 | 1.505 | 1.610 d | 144 | 0.550 | 0.463 | 0.507 bc | 91 |
| $N_3P_o$ | 2.275 | 1.995 | 2.135 g | 191 | 0.463 | 0.288 | 0.376 a | 67 |
| $N_3P_1$ | 1.855 | 1.785 | 1.820 e | 163 | 0.550 | 0.400 | 0.475 b | 85 |
| $N_3P_2$ | 2.135 | 1.855 | 1.995 f | 178 | 0.500 | 0.425 | 0.463 b | 83 |
| **Mean** | 1.528 a | 1.466 a | 1.497 | | 0.582 b | 0.503 a | 0.543 | |
| **Rel.** | 100 | 96 | | | 100 | 86 | | |

**Table (18) :** Effect of variety and fertilization of chemical content of rice grains in 1986 season.

| Fetilization treatments | N % | | | | Protein content | | | | P % | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Giza 172 | IR 1626 | Mean | Rel. | Giza 172 | IR 1626 | Mean | Rel. | Giza 172 | IR 1626 | Mean | Rel. |
| $N_oP_o$ (Control) | 1.50 | 1.45 | 1.48 a | 100 | 9.38 | 9.06 | 9.22 a | 100 | 0.367 | 0.375 | 0.371 c | 100 |
| $N_oP_1$ | 1.70 | 1.40 | 1.55 ab | 105 | 10.63 | 8.75 | 9.69 ab | 105 | 0.483 | 0.400 | 0.442 d | 119 |
| $N_oP_2$ | 1.60 | 1.45 | 1.53 a | 103 | 10.00 | 9.06 | 9.53 a | 103 | 0.558 | 0.560 | 0.559 e | 151 |
| $N_1P_o$ | 1.95 | 1.55 | 1.75 cd | 118 | 12.19 | 9.69 | 10.94 cd | 119 | 0.350 | 0.300 | 0.352 bc | 95 |
| $N_1P_1$ | 1.80 | 1.45 | 1.63 a-c | 110 | 11.25 | 9.06 | 10.16 a-c | 110 | 0.358 | 0.375 | 0.367 c | 99 |
| $N_1P_2$ | 1.90 | 1.45 | 1.68 bc | 114 | 11.88 | 9.06 | 10.47 bc | 114 | 0.367 | 0.358 | 0.363 c | 98 |
| $N_2P_o$ | 2.05 | 1.95 | 2.00 ef | 135 | 12.81 | 12.19 | 12.50 e | 136 | 0.300 | 0.300 | 0.300 ab | 81 |
| $N_2P_1$ | 2.00 | 1.70 | 1.85 de | 125 | 12.50 | 10.63 | 11.57 d | 125 | 0.375 | 0.300 | 0.338 bc | 91 |
| $N_2P_2$ | 1.80 | 1.70 | 1.75 cd | 118 | 11.25 | 10.63 | 10.94 cd | 119 | 0.375 | 0.333 | 0.354 bc | 95 |
| $N_3P_o$ | 2.15 | 2.20 | 2.18 g | 147 | 13.44 | 13.75 | 13.60 f | 148 | 0.300 | 0.283 | 0.293 a | 79 |
| $N_3P_1$ | 2.10 | 1.95 | 2.03 e-g | 137 | 13.13 | 12.19 | 12.66 e | 137 | 0.392 | 0.300 | 0.346 bc | 93 |
| $N_3P_2$ | 2.20 | 2.00 | 2.10 fg | 142 | 13.75 | 12.50 | 13.13 ef | 142 | 0.350 | 0.292 | 0.321 bc | 87 |
| Mean | 1.90 b | 1.69 a | 1.80 | | 11.85 b | 10.55 a | 10.82 | | 0.381 b | 0.348 a | 0.365 | |
| Rel. | 100 | 89 | | | 100 | 89 | | | 100 | 91 | | |

of rice grains varied with variety. Similar results were obtained by Taira et al. (1979). Likewise, Abdel Naby (1980), found that crude protein percentage of brown rice varied among cultivars. The percentages obtained here, were 8.48, 8.76 and 8.47 for Giza 159, Giza 171 and Giza 172, respectively.

**15.2. Effect of fertilization :**

Data in Tables (17 and 18) indicate clearly that application of N and P significantly increased percentage of nitrogen in flag leaf and grains of rice. Similarly, crude protein content of grains significantly increased with increasing levels of fertilizers. The highest value (13.75%) was produced from the application of 90 kg N/fed. without P-application. It is clear that N is an important constituent of rice grains. These results show the important role of added N in improving protein content in grain crops. Similar results were obtained by Eggum and Juliano (1975), Dutta and Barua (1978), Saleh and El-Shony (1978) and Mahatim et al. (1979). On the other hand, application of 48 kg $P_2O_5$ decreased the percentages of N and crude protein in grains, especially in the case of 60 kg N/fed. These results did not agree with those obtained by Bhuiya et al. (1979) and Patipanawattana and Nielson (1979). They reported that P had no significant effect on grain CP content.

**15.3. Effect of the interaction :**

The effect of the interaction of varieties and fertilization on nitrogen content was not significant in the two successive seasons (Tables 17 and 18).

## B. Phosphorous Content :

### 15.1. Effect of varieties :

Varieties differed significantly in P-percentage of flag leaf and grains. It is obvious that the P-content was greater in Giza 172 than in IR-1626. It could be concluded that there were significant differences in the percentage of P among rice varieties. Taira et al. (1979) came up with a similar conclusion. They reported that P content of milled rice varied with varieties.

### 15.2. Effect of fertilization :

Results in Tables (17 and 18) indicate clearly that fertilization with N and P showed significant effect on P-percentages of flag leaf at heading stage and grains of rice at harvesting stage. The effect of P-fertilizer on P-concentration was more clear where N not applied, whereas this effect decreased as the N level increased. These results were expected since the translocation of P from roots to shoots was curtailed by increasing N-levels. Moreover, it is of interest to point out that the reduction in P-percentage due to N can be explained on the basis of a dilution effect.

It could be concluded that applications of phosphorous alone up to 48 kg $P_2O_5$ (NoP2) resulted in an increases in P % of flag leaf and rice grains. This effect was more clear where no N was applied, and decreased as the N level increased. There are many reports in the literature demonstrating that application of N decreased the P-content at the lowest P-level but at higher P-levels of P, it increased it at higher P-levels (Patipanawattana and Nielson, 1979). In addition,

Ittyavirah et al. (1979) reported that application of nitrogen alone produced progressive decreases in yield of rice and the plants showed P-deficiency symptoms.

### 15.3. Effect of the interaction :

The effect of the interaction of rice varieties and fertilization on the percentage of P was not significant in the two successive seasons (Tables 17 and 18).