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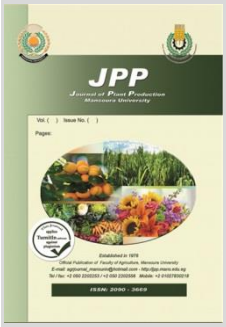
# Study of some Crop and Technological Characteristics of Some Wheat Cultivars Under Different Levels of Nitrogen Fertilization and Their Affected by Rust Diseases

**Gebrel, E. E. M. A[1]; M. O. Al-Farouk[1] and M. A. Gad[2]**

[1]Wheat Res Dep. Field Crops Res. Institute, ARC, Egypt
[2]Wheat Diseases Res. Section, Plant Pathology Res. Institute, ARC, Egypt




## ABSTRACT

For a two -years field experiment field was carried out at El-Gemmeiza Agric. Res. Stat., A.R.C., El-Gharbeia Governorate, Egypt during 2018/19 and 2019/ 20 seasons ,to study the effect of two nitrogen levels (50 and75 kg N/fed.) on yield , yield components and quality traits of thirty eight wheat cultivars *( Triticum aestivum L.).* The experimental design was a split- plot design with four replications .The main plot treatments were occupied by the two nitrogen fertilizer, while the wheat cultivars were assigned in the sub- plots. The results revealed that nitrogen fertilizer level had a significant effect on all studied traits in both seasons. Applied nitrogen level of 75 kg N/fed. increased days to heading, days to maturity, plant height, number of grains/spike, number of spikes/$m^2$, 1000-grain weight, grain yield , germination %, relative density and dry matter % , However, EC ( µmhos/g) values were decreased with the same nitrogen rate in both seasons. Misr 2 cultivar recorded the highest days to heading, days to maturity, plant height. Although, Misr 3 cultivar ranked the highest number of spikes per $m^2$, grain yields per feddan, germination %, relative density as well as dry matter % in both seasons. This work recommends growing Misr 3 cultivar using 75 kg N/fed.for achieving high yield and its components of wheat with good quality of seed and high resistant against rust diseases under Gemmeiza zone condition.

***Keywords:*** *wheat, yield components, nitrogen fertilizer, grain quality, Leaf, stripe, resistance, stem rust.*

## INTRODUCTION

Wheat (*Triticum aestivum* L.) is one of the most important field crops in Egypt. Nevertheless, the yield production is not sufficient to cover the local consumption in Egypt (FAO, 2013). The properties of its grain make it the main leading cereal for human food. The increasing demands of wheat is mainly due to the fast growth of human population, Therefore, maximizing wheat production should be achieved through cultivation of high yield potential wheat cultivars under appropriate agronomic practices such as irrigation, fertilizer and weed control.

Nitrogen plays an important role in plant life and it is considered an indispensable element for several vital functions. Several investigators reported that increasing nitrogen level more than 50 kg/fed. accompanied by a significant increase in number of spikes/m2, number of grains /spike, 1000-grain weight and grain yield Iqtidar *et al.,* (2006); Ahmed *et al.,* (2009); Abedi *et al.,* (2010); Ansar *et al.,* (2010); Ooro *et al.,* (2011); Abd EL- Hameed, (2012); Gheith *et al.,* (2013) and Shirazi *et al.,* (2014) Moreover, many workers showed that wheat cultivars differed in yield and yield components (Abd EL- Hameed, (2005); Zidan *et al.,* (2009); Amin *et al.,* (2010) and Gheith, *et al .,* (2013).

Rusts is the main diseases confronting wheat production in Egypt. This policy helped to save guard the crop and to buffer against sudden break of rust attach. The only alternative method is to obtain higher yield per unit area by growing high yielding varieties resistant to diseases. For assessed yield, yield contributing traits and resistance to rust diseases of wheat in six genotypes of bread wheat; Misr1, Giza168, Shandaweel 1, Gemmeiza 9, Sids 1 and Sakha 94 were crossed in a half diallel cross mating design in 2016/17 growing season then evaluated with their 15 crosses under three nitrogen fertilization levels, i.e. 25, 50 and 75 kg N fed-1 during 2017/18 growing season. The results showed that average coefficient of infection (ACI) was (15, 15, 20) for Misr1 and (20, 20, 25) for Shandaweel 1 but for the cross combination Misr 1× Shandaweel 1 was (10, 10, 15) For yellow rust and this concluded that the rust severity in crosses less than in parents with N- application and the studies confirmed that there is genetic variation for yield and rust response in parents and their crosses (Rashwan *et al.,* 2018).

Gad *et al.* (2019) examined the response of Some Wheat Cultivars, i.e. Gemmeiza 11, Shandaweel 1 and Giza 168 to Different Nitrogen Fertilizer Rates i.e. 0, 25, 50, 75, 100kg N fed and their Relation to yellow Rust Disease and found that Increased levels of N increased the severity of rust disease during grain filling that resulted in positive correlations between N rates and rust severity.

The present investigation was planned, therefor, to determine the effect of nitrogen fertilization on the growth, yield and its components and some quality traits of thirty eight wheat cultivars under middle delta region condition.

## MATERIALS AND METHODS

The present investigation was carried out at El-Gemmeiza Agric. Res. Stat., A.R.C., El- Gharbeia Governorate, Egypt. During the two growing successive seasons of 2018/19 and 2019/ 20 to study the effect of two

* **Corresponding author.**
**E-mail address: essam_gebrel@yahoo.com**
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nitrogen levels (50 and75 kg N/fed.) on yield , yield components and quality of thirty eight wheat cultivars *( Triticum aestivum L.).*

The experimental design was a split- plot design with four replications. The main plot treatments were occupied by the two nitrogen fertilizer, while the wheat cultivars were assigned in the sub- plots. Seeds were sown on 15th November in the first season and on 20th November in the second growing season. The harvest area was 4.2 m2 i.e. 1.2 width and 3.5 m2 in length. Nitrogen was added in the form of urea (46% N) .Phosphate fertilizer was applied at the rate of 100 kg calcium superphosphate/fad.(15.5 kg P2O5) during seedbed preparation. The common agricultural practices for growing wheat according to the recommendations of Ministry of Agriculture were followed, except the factors under study.

**The studied traits:**

**1-Vegetative characteristics**: Number of days to heading, Number of days to maturity, Plant height.

**2-Yield and yield components:** Number of spikes/$m^2$, Number of grains/spike, 1000-grain weight (g), Grain yield (ardab/fad).

**3- Seed quality:** percentage of germination and the electrical conductivity (EC) of leached from four replicates of 50 seed weight and soaked in 250 ml of distilled water for 24 h was measured in µ-mhos using conductivity meter, were carried out under optimum conditions according to the international rules ( I.S.TA, 1993).Relative density of seed was calculated according to Karmer and Twigg (1962). The percentage of dry matter was determined according to the procedures outlined in (A.O.A.C, 1990).

**Table 1. The pedigree of the wheat cultivars are shown.**

| Cultivars | Released year | Pedigree |
|---|---|---|
| Giza 139 | 1947 | HINDI 90/KENYA 256G. |
| Giza 155 | 1968 | GIZA-144/3/MIDA,USA/CADET,USA//2*HINDI-62. |
| Giza 156 | 1972 | RIO-NEGRO/MENTANA*2//KENYA/3/GIZA-135/LERMA-950. |
| Giza 157 | 1977 | GIZA-155/4*PITIC-62/3/LERMA-ROJO-64*2//TEZANOS-PINTOS-PRECOZ/2*KNOTT. |
| Giza 160 | 1982 | CHENAB-70/GIZA-155; CHENAB-70/GIZA-156. |
| Giza 162 | 1988 | VICAM-71//CIANO-67/SIETE-CERROS-66/3/KALYANSONA/BLUEBIRD. |
| Giza 163 | 1988 | F-61-70/BONANZA//CIANO-67/SIETE-CERROS-66. |
| Giza 164 | 1988 | KAVKAZ/(SIB)BUHO//KALYANSONA/BLUEBIRD |
| Giza 168 | 1999 | MIRLO(MRL)/BUCKBUCK//SERI-82. |
| Giza 171 | 2013 | Sakha93/Gemmeiza9 S 6-1GZ-2GZ-2GZ-0S. |
| Sakha 8 | 1976 | INDUS/NORTENO "S".PK 3418-6S-15W-OS |
| Sakha 61 | 1980 | INIA/RL-4220//7C/YR"S".CM-15430-2S-5S-0S. |
| Sakha 69 | 1980 | INIA/RL-4220//7C/YR"S".CM-15430-2S-6S-0S. |
| Sakha 92 | 1988 | NAPO-63//INIA-66/WREN,MEX. |
| Sakha 93 | 1999 | SAKHA-92/TR-810328. |
| Sakha 94 | 2004 | OPATA / RAYON // KAUZ. |
| Sakha 95 | 2013 | SKAUZ*2_SRMA. |
| Gemmeiza 1 | 1991 | MAYA/ON//II60.147/3/BB/GLL/4/CHAT. |
| Gemmeiza 3 | 1997 | BB/7C*2//Y50E/KAL*3/2/SKH8/4/PRV/WW15/3/BJ"S"//ON/BON |
| Gemmeiza 5 | 1998 | VEERY(SIB)/SWM-6525; VEERY/SALWA-1. |
| Gemmeiza 7 | 1999 | CMH74.630/5X//SERI82/3/AGENT. |
| Gemmeiza 9 | 1999 | ALD'S'/HUAC'S'//CMH74.630/5X. |
| Gemmeiza10 | 2006 | MAYA74"S"/ON//II60.147/3/BB/GLL/4/CHAT"S"/5/CROW"S" |
| Gemmeiza11 | 2011 | BOW"S"/ KVS"S"// 7C/ SERI 82/3/ GIZA 168/ SAKHA 61 |
| Gemmeiza12 | 2012 | OTUS/3/SA/THB//VEE. |
| Sids 1 | 1996 | HD-2172/(SIB)PAVON//1158-57/(SIB)MAYA-74. |
| Sids 4 | 1999 | VICAM-71//CIANO-67/SIETE-CERROS 0 |
| Sids 6 | 1999 | MAYA"S"/MON"S"//CMH74A.592/3/SAKHA8*2S. |
| Sids 7 | 1999 | Maya"s"/Mon's' //CMH74A-592/3/Saka8*2SD 0002-8SD-1SD-1SD-0SD. |
| Sids 12 | 2008 | BUC//7C/ALD/5/MAYA74/ON//1160 - 147/3/BB/GLL/4/CHAT"S"/6/MAYA/VUL//CMH74A.630//4*SX |
| Shandweel 1 | 2013 | SITE/MO/4/NAC//3*PVN/3/MiRLO |
| Hindi 62 | 1921 | Selected from the varieties of the town. |
| Mabrook | 1921 | GIZA 7/BALADI 42. |
| Sohag 3 | 1991 | MEXI"s"/MGHA/51792//DURUM6 |
| Bani Suef 1 | 1987 | JO"s"/AA"s"//FG"s" = BITTERN"s" |
| Misr 1 | 2010 | Oasis/SKauz//4* Bcn/3/2*pastor |
| Misr 2 | 2011 | SKauz/Bav92SKauz/Bav92 |
| Misr 3 | 2018 | ATTILA*2/PBW65*2/KACHU CMSS06Y00582T-099TOPM-099Y-099ZTM-099Y-099M-10WGY-0B-0EGY |

**Table 2. The mechanical and chemical properties of the experimental soil are shown.**

| Variable | Seasons | |
|---|---|---|
| | 2018/19 | 2019/20 |
| Mechanical analysis | | |
| Sand ( %) | 14.52 | 14.20 |
| Silt ( %) | 35.48 | 33.70 |
| Clay ( %) | 50.00 | 52.10 |
| Soil texture class | Clay | Clay |
| Chemical analysis | | |
| Available N ppm | 54.00 | 43.67 |
| Available P ppm | 5.35 | 4.27 |
| Available K ppm | 340 | 289 |
| Organic matter % | 1.79 | 1.62 |
| PH* | 8.00 | 8.11 |
| EC** | 1.54 | 1.49 |

**PH* was determined in saturated soil paste.**

**EC** and soluble ions were determined in soil water paste extract.**

**4- Disease assessment:**

When rust symptoms were fully developed (nearly at the early dough stage, Large, 1954), the rust data of adult plant reaction were scored as plant response and rust severity combined together.

Plant response was expressed in five infection types according to Johnston and Browder (1966) i.e. Immune (0), no uredia or other macroscopic sign of infection, Resistant (R), small uredia surrounded by necrosis, Moderately Resistant (MR), small to medium uredia surrounded by chlorosis or necrosis, Moderately Susceptible (MS), medium-sized uredia that may be associated with chlorosis and Susceptible (S), large uredia without chlorosis or necrosis.

When the spreader plants were 50% infected, the rust data were scored four times for disease severity (DS) as percentage coverage of leaves with rust pustules using Cobb's scale modified by Peterson *et al*. (1948) at weekly intervals.

Partial resistance (slow rusting) behavior was assessed through host response and epidemiological parameters estimates i.e. average coefficient of infection (ACI) according to Saari and Wilcoxson (1974) and Pathan and Park (2006) by multiplying of disease severity (DS) and constant values of infection type (IT). The constant values for infection types were used based on; Immune (O) = 0, Resistant (R) = 0.2, Moderately resistant (MR) =0.4, Moderately Resistant To Moderately Susceptible (MRMS) = 0.6, Moderately Susceptible (MS) = 0.8 Moderately Susceptible to Susceptible (MSS) = 0.9, Susceptible = 1.

**Statistical analysis:**

All the data collected were subjected to statistical analysis of variance as described by Sendecor and Chochran (1981) and treatment means were compared by least significant difference (LSD) at 5 % level of probability.

## RESULTS AND DISCUSSION

**A: Nitrogen levels (N):**

The analysis of variance showed significant variations between the two applied nitrogen levels for all traits in both seasons. The highest level of applied Nitrogen 75 kg N/fed. recorded the highest values for all studied traits, while the lowest level 50 kg N/fed. scored the lowest ones.

The results indicated that earliest heading, number of days to maturity dates and tallest plants were achieved by the highest level of applied Nitrogen 75 kg N/fed., so it is quite evident that, nitrogen encouraged the vegetative growth of wheat plants and extended the growth stage due to its vital role in plant growth and formation of vegetative organs which lead to delaying the expulsion date of the spike. Moreover, the availability of nitrogen enhanced more leaf area resulting in higher photosynthesis rate, higher translocation of carbohydrates from source to growing points and thereby resulted in taller plants. These results are consistent with those of Abo-Marzoka (2005) who indicated that, increasing nitrogen levels (50, 70 and 90 kg/fed.) highly significantly increased number of days to 50% heading and 100% heading. Furthermore, Abebe and Mamo (2016) where they found that, increment of N-fertilizer application high significantly raised number of days to heading and maturity. Also, Belete *et al.,* (2018) noticed that, increasing N level to the recommended dose lead to activation of cell division and cell enlargement and finally increasing the growth of the plant, which is reflected in increasing plant height.

Concerning to grain yield and its components, the trend of data was logic, predictable and similar to the previous traits, whereas the highest level of applied Nitrogen 75 kg N/fed. scored the highest number of grains/spike, number of spikes/$m^2$, 1000-grain weight and consequently grain yield per feddan.

It is well known that, nitrogen application enhanced the growth of wheat plants and plays a positive role in enhancing photosynthesis and carbohydrates translocation, the formation of sexual organs, pollination, fertilization and meristematic activity of plant organs, which raise the production and translocation of the dry matter from the source to the sink (grains) which in turn increased the number of grains per spike, number of spikes/$m^2$ and 1000 grain weight. In turn these increments in the previous mentioned traits account much for increasing grain yield due to application of the highest level of nitrogen. These results are in accordance with those reported by Koriem (2008), Javaid *et al.* (2014), Ali *et al.* (2015) and Shab *et al.* (2016), where they studied the response of yield and yield components of wheat to different nitrogen levels and they revealed significant and gradual increments in number of grains/spike, number of spikes/$m^2$, 1000-grain weight and grain yield with raising the level of the used mineral nitrogen fertilizer up to the recommended dose.

**B: Cultivars:**

The analysis of variance showed significant differences among the studied 38 cultivars for all traits. Worthy to note that, from agronomical perspective the evaluation of the most Egyptian wheat cultivars under two different nitrogen levels was the agronomical objective of this study which indicate to the trends of wheat breeders in selecting and breeding new released wheat cultivars. So the data in Table (3) will be interpreted based on two levels. Firstly, the comparison among the cultivars released from the same place (research station) and secondly, comparing among the groups of the cultivars classified based on the place of its release (research station).

**B: 1- Number of days to heading:**

Concerning Giza cultivars group, Giza 139 was the latest cultivar and surpassed other cultivars in number of days to heading with significant differences with Giza 168 and Giza 171 cultivars which were the earliest ones in both seasons, indicating that the recent cultivars were characterized by earliest heading in Giza cultivars group.

Regarding to Sakha cultivars group, Sakha 95 and Sakha 94 cultivars were the latest and surpassed other cultivars in number of days to heading with significant differences with Sakha 61 and Sakha 93 cultivars which were the earliest ones in both seasons, indicating that the recent cultivars were characterized by latest heading in Sakha cultivars group.

Concerning Gemmeiza cultivars group, Gemmeiza 9 cultivar was the latest and surpassed other cultivars in number of days to heading with significant differences with Gemmeiza 7 and Gemmeiza 11 cultivars which were the earliest ones in both seasons.

For Sids cultivars group, Sids 12 cultivar was the latest and surpassed other cultivars in number of days to heading with significant differences with Sids 4 and Sids 6 cultivars which were the earliest ones in both seasons.

Regarding to Misr cultivars group, Misr 2 and Misr 3 cultivars were the latest and surpassed other cultivar Misr 1 in number of days to heading significantly which was the earliest one in both seasons.

In general, Misr 2, Misr 3 and Giza 139 cultivars recorded the highest number of days to heading and were the latest heading cultivars. On the other hand, Sids 6, Sids 4, Sids 7 and Giza 168 cultivars recorded the lowest number of days to heading and were the earliest heading cultivars.

**B: 2- Number of days to maturity:**

Concerning Giza cultivars group, Giza 163, 164 and 171 was the latest cultivar and surpassed other cultivars in number of days to maturity with significant

differences with Giza 160 and Giza 168 cultivars which were the earliest ones in both seasons.

Regarding to Sakha cultivars group, Sakha 8 and Sakha 95 cultivars were the latest and surpassed other cultivars in number of days to maturity with significant differences with Sakha 61, Sakha 92 and Sakha 93 cultivars which were the earliest ones in both seasons.

Concerning Gemmeiza cultivars group, Gemmeiza 11 cultivars were the latest and surpassed other cultivars in number of days to maturity with significant differences with Gemmeiza 7 and Gemmeiza 9 cultivars which were the earliest ones in both seasons

For Sids cultivars group, Sids 12 cultivar was the latest and surpassed other cultivars in number of days to maturity with significant differences with Sids 4 and Sids 6 cultivars which were the earliest ones in both seasons.

**Table 3. Effect of nitrogen levels and cultivars on number of days to heading (day), number of days to maturity (day), plant height (cm) and number of grains/spike in 2018/2019 and 2019/2020 seasons.**

| Characters | Days to heading (day) | | Days to maturity(day) | | Plant height (cm) | | No. of grains/spike | |
|---|---|---|---|---|---|---|---|---|
| Seasons / Treatment | 2018/19 | 2019/20 | 2018/19 | 2019/20 | 2018/19 | 2019/20 | 2018/19 | 2019/20 |
| A:Nitrogen level (N) | | | | | | | | |
| 50 kg N/fed. | 79.18 | 73.84 | 131.17 | 125.36 | 93.27 | 87.00 | 50.54 | 46.90 |
| 75 kg N/fed. | 94.77 | 88.39 | 150.87 | 143.48 | 111.66 | 104.15 | 60.68 | 56.29 |
| L.S.D. at 5% | 0.77 | 0.98 | 1.16 | 1.49 | 0.89 | 1.21 | 0.65 | 0.91 |
| B: Cultivars (C) | | | | | | | | |
| Giza 139 | 98.67 | 91.33 | 148.67 | 141.00 | 115.67 | 106.83 | 35.33 | 33.00 |
| Giza 155 | 96.00 | 88.67 | 150.00 | 142.17 | 112.66 | 105.00 | 39.50 | 36.67 |
| Giza 156 | 95.00 | 87.83 | 147.17 | 139.33 | 117.33 | 108.50 | 46.67 | 44.33 |
| Giza 157 | 93.50 | 87.67 | 148.67 | 140.50 | 120.50 | 112.00 | 47.83 | 44.50 |
| Giza 160 | 96.17 | 95.33 | 145.67 | 137.83 | 118.00 | 110.00 | 46.00 | 42.50 |
| Giza 162 | 97.17 | 91.67 | 149.50 | 140.17 | 120.83 | 113.67 | 52.83 | 49.50 |
| Giza 163 | 92.50 | 86.83 | 154.67 | 145.83 | 116.50 | 107.00 | 51.67 | 47.83 |
| Giza 164 | 91.33 | 85.33 | 155.67 | 146.17 | 116.00 | 109.33 | 51.83 | 48.50 |
| Giza 168 | 85.00 | 79.33 | 145.67 | 138.83 | 111.67 | 106.50 | 74.50 | 69.33 |
| Giza 171 | 91.15 | 83.12 | 161.66 | 152.82 | 114.66 | 110.83 | 71.33 | 68.00 |
| Sakha 8 | 88.33 | 82.17 | 161.67 | 152.00 | 110.83 | 101.67 | 71.17 | 65.17 |
| Sakha 61 | 88.00 | 80.66 | 153.35 | 146.50 | 112.33 | 104.00 | 60.50 | 56.33 |
| Sakha 69 | 90.50 | 84.17 | 155.83 | 148.00 | 110.67 | 103.33 | 52.33 | 47.67 |
| Sakha 92 | 89.67 | 82.50 | 151.17 | 142.33 | 116.50 | 108.33 | 43.17 | 38.00 |
| Sakha 93 | 87.17 | 80.50 | 148.00 | 140.17 | 107.33 | 99.33 | 55.67 | 49.00 |
| Sakha 94 | 92.16 | 86.50 | 155.32 | 150.52 | 118.17 | 114.50 | 63.67 | 58.00 |
| Sakha 95 | 96.33 | 89.17 | 156.33 | 149.50 | 113.50 | 111.67 | 67.00 | 64.83 |
| Gemmeiza 1 | 93.17 | 86.17 | 152.50 | 142.83 | 103.50 | 95.50 | 57.67 | 51.67 |
| Gemmeiza 3 | 94.33 | 88.50 | 143.33 | 135.67 | 99.16 | 92.17 | 54.50 | 48.50 |
| Gemmeiza 5 | 95.33 | 89.83 | 148.17 | 138.67 | 95.17 | 109.83 | 56.17 | 50.66 |
| Gemmeiza 7 | 89.00 | 82.83 | 142.67 | 133.33 | 99.17 | 91.16 | 68.50 | 61.17 |
| Gemmeiza 9 | 97.33 | 91.33 | 140.33 | 132.17 | 115.33 | 109.00 | 65.83 | 57.67 |
| Gemmeiza10 | 93.50 | 86.50 | 150.83 | 143.00 | 97.167 | 90.00 | 62.50 | 57.00 |
| Gemmeiza11 | 86.00 | 80.00 | 157.83 | 151.17 | 117.17 | 113.67 | 81.53 | 77.00 |
| Gemmeiza12 | 93.17 | 87.33 | 153.83 | 147.50 | 111.83 | 108.00 | 68.17 | 65.50 |
| Sids 1 | 86.33 | 80.33 | 150.83 | 144.33 | 112.00 | 105.50 | 49.67 | 46.83 |
| Sids 4 | 83.67 | 79.17 | 142.33 | 137.00 | 111.00 | 104.17 | 34.50 | 32.83 |
| Sids 6 | 81.33 | 77.17 | 141.67 | 136.17 | 92.66 | 87.50 | 49.17 | 46.66 |
| Sids 7 | 84.83 | 76.33 | 144.67 | 139.17 | 97.50 | 91.17 | 52.17 | 49.67 |
| Sids 12 | 90.17 | 85.83 | 156.00 | 150.67 | 115.67 | 112.50 | 79.50 | 76.67 |
| Shandweel 1 | 92.33 | 86.50 | 158.33 | 152.50 | 106.33 | 99.83 | 62.17 | 58.83 |
| Hindi 62 | 88.83 | 83.83 | 149.33 | 142.67 | 106.33 | 100.67 | 45.67 | 43.67 |
| Mabrook | 90.83 | 86.50 | 155.00 | 149.00 | 107.00 | 101.00 | 52.33 | 50.33 |
| Sohag 3 | 86.17 | 82.17 | 141.17 | 136.83 | 94.17 | 90.17 | 68.33 | 65.33 |
| Bani Suef 1 | 87.16 | 82.00 | 145.33 | 139.83 | 95.50 | 90.00 | 61.50 | 58.00 |
| Misr 1 | 91.83 | 85.83 | 159.17 | 155.17 | 116.50 | 112.67 | 70.50 | 68.83 |
| Misr 2 | 99.67 | 93.33 | 162.67 | 156.50 | 118.17 | 114.33 | 73.67 | 66.67 |
| Misr 3 | 99.50 | 94.00 | 153.83 | 147.33 | 107.16 | 103.50 | 60.17 | 57.16 |
| L.S.D. at 5% | 5.95 | 5.44 | 5.94 | 5.63 | 8.71 | 8.43 | 9.63 | 9.11 |
| C: Interactions | | | | | | | | |
| N × C | NS | NS | ** | ** | NS | NS | NS | NS |

Regarding to Misr cultivars group, the cultivars arrangement in a descending order was Misr 2 followed by Misr 1, whereas Misr 3 cultivar ranked the last and scored the earliest one in both seasons.

In general, Misr 2, Sakha 61 and Sakha 8 cultivars recorded the highest number of days to maturity and were the latest mature cultivars. On the other hand, Gemmeiza 9, Sohag 3 and Sids 6 cultivars recorded the lowest number of days to maturity and were the earliest mature cultivars.

**B: 3- Plant height:**

Concerning Giza cultivars group, Giza 157 and Giza 162 recorded the tallest plants and surpassed significantly Giza 155 and Giza 168 cultivars which recorded the shortest ones in both seasons.

Regarding to Sakha cultivars group, Sakha 92 and Sakha 94 recorded the tallest plants and surpassed significantly Sakha 93 cultivar which recorded the shortest one in both seasons.

Concerning Gemmeiza cultivars group, Gemmeiza 9 and Gemmeiza 11 recorded the tallest plants and surpassed significantly Gemmeiza 5 and Gemmeiza 10 cultivars which recorded the shortest ones in both seasons.

For Sids cultivars group, Sids 1, Sids 4 and Sids 12 cultivar recorded the tallest plants and surpassed

significantly Sids 6 and Sids 7 cultivars which recorded the shortest ones in both seasons.

Regarding to Misr cultivars group, the cultivars arrangement in a descending order was Misr 2 followed by Misr 1, whereas Misr 3 cultivar ranked the last and scored the shortest plants in both seasons.

In general, Giza 157 and Giza 162, Misr 2 and Sakha 94 cultivars recorded the tallest plants. On the other hand, Sids 6, Sohag 3 and Gemmeiza 5 cultivars recorded the shortest ones in both seasons.

**B: 4- Number of grains/spike:**

Concerning Giza cultivars group, the recent cultivars Giza 171 and Giza 168 recorded the highest number of grains per spike and surpassed significantly other previous released cultivars. On the other hand, Giza 139 and Giza 155 cultivars recorded the lowest numbers in both seasons.

Regarding to Sakha cultivars group, Sakha 8, Sakha 94 and Sakha 95 recorded the highest number of grains per spike and surpassed significantly other cultivars. On the other hand, Sakha 92 cultivar recorded the lowest numbers in both seasons.

Concerning Gemmeiza cultivars group, Gemmeiza 11 recorded the highest number of grains per spike and surpassed significantly all other Gemmeiza cultivars. However, Gemmeiza 1, Gemmeiza 3 and Gemmeiza 5 cultivars recorded the lowest numbers in both seasons.

For Sids cultivars group, the recent cultivar Sids 12 recorded the highest number of grains per spike and surpassed significantly all other sids cultivars. On contrast, Sids 4 recorded the lowest numbers of grains per spike in both seasons.

Regarding to Misr cultivars group, the cultivars arrangement in a descending order for the trait in concern was, Misr 2 followed by Misr 1 with insignificant differences between them, whereas Misr 3 cultivar ranked the last and scored the lowest numbers of grains per spike in both seasons.

In general, Gemmeiza 11 and Sids 12 cultivars recorded the highest number of grains per spike. On the other hand, Sids 4, Giza 139 and Giza 155 cultivars recorded the lowest number of grains per spike in both seasons.

**B: 5- Number of spikes/$m^2$:**

Concerning Giza cultivars group, the cultivars Giza 164, Giza 163 and Giza 171 recorded the greatest number of spikes per $m^2$ and surpassed significantly Giza 139 and Giza 155 cultivars which recorded the lowest numbers in both seasons.

Regarding to Sakha cultivars group, Sakha 93 and Sakha 95 recorded the highest number of spikes per $m^2$ and surpassed significantly other cultivars. On the other hand, Sakha 69 cultivar recorded the lowest numbers in both seasons.

Concerning Gemmeiza cultivars group, Gemmeiza 9 and Gemmeiza 12 recorded the highest number of spikes per $m^2$. However, Gemmeiza 1 and Gemmeiza 3 cultivars recorded the lowest numbers in both seasons.

For Sids cultivars group, the cultivar Sids 1 and Sids 12 recorded the highest number of spikes per $m^2$ and surpassed significantly all other sids cultivars. On contrast, Sids 4 and Sids 6 recorded the lowest numbers in both seasons.

Regarding to Misr cultivars group, Misr 3 cultivar scored the highest number of spikes per $m^2$ followed by Misr 2 and Misr 3 cultivars where there were no significant differences between them and both ranked the last and scored the lowest numbers of spikes per $m^2$ in both seasons.

In general, Misr 3 cultivar ranked first and scored the highest number of spikes per $m^2$. On the other hand, Gemmeiza 1 cultivar ranked the last and recorded the lowest number of spikes per $m^2$ in both seasons.

**B: 6- 1000 grain weight:**

The trend of that trait was almost similar to the trend of number of grains per spike.

For Giza cultivars group, the recent cultivars Giza 171 and Giza 168 recorded the heaviest 1000 grain weights and surpassed significantly other previous released cultivars. On the other hand, Giza 139 cultivar recorded the lightest1000 grain weights in both seasons Table(4).

Regarding to Sakha cultivars group, Sakha 95, Sakha 61 and Sakha 94 recorded the heaviest 1000 grain weights and surpassed Sakha 92 and Sakha 93 cultivars which recorded the lightest 1000 grain weights in both seasons.

Concerning Gemmeiza cultivars group, Gemmeiza 12 recorded the highest 1000 grain weights. However, Gemmeiza 5 and Gemmeiza 1 cultivars recorded the lowest 1000 grain weights in both seasons.

The variation among Sids cultivars didn't reach to the level of significance in this trait.

Regarding to Misr cultivars group, the trend of data in the first season only was similar to the previous trait, where Misr 3 cultivar scored the highest 1000 grain weights followed by Misr 2 and Misr 3 cultivars where there were no significant differences between them and both scored the lowest 1000 grain weights. However, the variation among Misr cultivars didn't reach to the level of significance in the second season.

In general, Giza 171, Giza 168 and Gemmeiza 12 cultivars recorded the highest 1000 grain weights. On the other hand, Shandweel 1 and Sids 6 cultivars recorded the lowest 1000 grain weights in both seasons.

**B: 7- Grain yield (ard./fed.):**

It is quite known that, final grain yield is determined by number of grains per spike, number of spikes per unit area and 1000 grain weight traits (yield triangle traits). This triangle is a useful representation of how yield components interact to achieve the given yield.

Worthy to note that, the data trend proves the main aim of the wheat breeding programs which is enhancing yield and its components depending on that triangle , it is noticeable that ,the recent cultivars in all studied cultivars groups recorded the highest grain yields per feddan as a result to the enhancement in grain yield triangle traits.

For Giza cultivars group, the recent cultivars Giza 171 and Giza 168 recorded the highest grain yields per feddan surpassed significantly other previous released cultivars. On the other hand, Giza 156 and Giza 139 cultivar recorded the lowest grain yields per feddan in both seasons. Also, the recent Sakha cultivars; Sakha 94 and Sakha 95 surpassed other previous released Sakha cultivars and scored the highest grain yield, while Sakha 8 cultivar scored the lowest grain yields per feddan in both seasons. Furthermore, the most recent cultivars in Gemmeiza cultivars group; Gemmeiza 10 and Gemmeiza 12 ranked first and surpassed other Gemmeiza cultivars in grain yield,

whereas Gemmeiza 5 and Gemmeiza 1 ranked the last grade. Same trend of data was observed regarding to Sids cultivars group, where the most recent cultivars Sids 12 recorded the highest grain yield, while Sids 6 recorded the lowest grain yield.

Finally, regarding to Misr cultivars group, Misr 3 cultivar scored the highest grain yield per feddan with insignificant differences with Misr 1 cultivar, in both seasons Table(4).

In general, Misr 3, Misr 1, Giza 171, Giza 168 and Gemmeiza 12 cultivars recorded the highest grain yields per feddan. On the other hand, Giza 156, Giza 163, Sakha 8 Giza 155, Gemmeiza 3, Giza 139, Sakha 69 and Shandweel 1 cultivars recorded the lowest 1000 grain yields per feddan in both seasons.

**Table 4. Effect of nitrogen levels and cultivars on number of spikes/m$^2$, 1000-grain weight and grain yield in 2018/2019 and 2019/2020 seasons.**

| Characters | No. of spikes/m$^2$ | | 1000-grain weight (g) | | Grain yield (ard./fed.) | |
|---|---|---|---|---|---|---|
| Seasons / Treatment | 2018/19 | 2019/20 | 2018/19 | 2019/20 | 2018/19 | 2019/20 |
| A:Nitrogen level (N) | | | | | | |
| 50 kg N/fed. | 307.25 | 291.13 | 41.07 | 37.70 | 14.05 | 12.49 |
| 75 kg N/fed. | 367.05 | 347.80 | 49.16 | 45.13 | 17.18 | 15.29 |
| L.S.D. at 5% | 2.02 | 2.15 | 0.10 | 0.21 | 1.80 | 1.23 |
| B: Cultivars (C) | | | | | | |
| Giza 139 | 304.33 | 285.83 | 40.56 | 37.33 | 11.38 | 10.60 |
| Giza 155 | 322.00 | 310.83 | 47.10 | 42.96 | 11.08 | 9.73 |
| Giza 156 | 332.67 | 314.83 | 41.73 | 38.08 | 10.10 | 8.40 |
| Giza 157 | 341.67 | 323.00 | 45.28 | 41.04 | 13.82 | 11.52 |
| Giza 160 | 339.33 | 331.17 | 39.70 | 36.71 | 14.42 | 13.39 |
| Giza 162 | 335.67 | 327.66 | 44.25 | 40.43 | 12.91 | 10.50 |
| Giza 163 | 365.17 | 349.67 | 47.48 | 42.68 | 10.15 | 7.67 |
| Giza 164 | 353.17 | 346.67 | 45.89 | 41.99 | 12.20 | 9.95 |
| Giza 168 | 331.67 | 313.83 | 59.14 | 52.76 | 19.91 | 19.21 |
| Giza 171 | 351.33 | 338.33 | 60.93 | 54.36 | 20.20 | 18.40 |
| Sakha 8 | 323.83 | 303.00 | 48.66 | 43.64 | 10.18 | 8.19 |
| Sakha 61 | 347.00 | 329.17 | 50.13 | 44.19 | 12.83 | 10.33 |
| Sakha 69 | 308.33 | 291.17 | 45.09 | 41.16 | 11.49 | 9.78 |
| Sakha 92 | 338.83 | 316.17 | 42.46 | 38.99 | 13.85 | 11.48 |
| Sakha 93 | 365.17 | 342.66 | 43.26 | 37.77 | 14.95 | 12.78 |
| Sakha 94 | 346.83 | 333.17 | 49.39 | 43.51 | 16.92 | 15.70 |
| Sakha 95 | 357.17 | 336.50 | 51.40 | 44.57 | 18.51 | 16.95 |
| Gemmeiza 1 | 241.50 | 226.17 | 41.55 | 37.86 | 12.58 | 10.40 |
| Gemmeiza 3 | 271.83 | 256.33 | 48.34 | 43.65 | 11.17 | 7.62 |
| Gemmeiza 5 | 305.50 | 295.33 | 39.81 | 37.43 | 12.71 | 11.65 |
| Gemmeiza 7 | 348.67 | 333.00 | 47.80 | 42.39 | 14.79 | 12.61 |
| Gemmeiza 9 | 361.00 | 343.67 | 49.73 | 45.06 | 14.25 | 12.00 |
| Gemmeiza10 | 322.67 | 306.00 | 44.56 | 41.08 | 18.57 | 16.48 |
| Gemmeiza11 | 341.33 | 329.83 | 46.14 | 42.44 | 14.12 | 11.30 |
| Gemmeiza12 | 370.33 | 358.83 | 56.35 | 50.45 | 19.83 | 18.95 |
| Sids 1 | 381.82 | 365.31 | 43.09 | 38.54 | 14.20 | 13.41 |
| Sids 4 | 219.80 | 206.50 | 44.75 | 40.80 | 14.05 | 12.58 |
| Sids 6 | 226.64 | 212.33 | 37.82 | 35.35 | 12.30 | 10.21 |
| Sids 7 | 286.65 | 274.10 | 40.01 | 36.81 | 13.93 | 11.75 |
| Sids 12 | 330.00 | 327.83 | 42.07 | 39.98 | 16.47 | 15.25 |
| Shandweel 1 | 375.67 | 360.17 | 37.29 | 35.01 | 11.71 | 9.73 |
| Hindi 62 | 281.79 | 267.75 | 42.25 | 37.48 | 13.70 | 10.31 |
| Mabrook | 285.00 | 270.49 | 40.13 | 35.66 | 18.32 | 16.27 |
| Sohag 3 | 279.67 | 258.33 | 47.06 | 45.37 | 15.37 | 12.73 |
| Bani Suef 1 | 318.00 | 302.83 | 45.62 | 42.35 | 17.48 | 16.13 |
| Misr 1 | 359.67 | 341.50 | 48.99 | 44.76 | 21.09 | 19.47 |
| Misr 2 | 363.83 | 349.33 | 47.13 | 44.77 | 18.90 | 17.50 |
| Misr 3 | 461.17 | 439.83 | 53.49 | 44.33 | 22.35 | 18.01 |
| L.S.D. at 5% | 33.45 | 31.72 | 7.11 | 6.75 | 2.64 | 2.17 |
| C: Interactions | | | | | | |
| N × C | NS | NS | NS | NS | NS | NS |

**C: Seed quality:**

Data in Tables (5) show that there were significant differences among N levels treatments regarding germination %, the electrical conductivity (EC), relative density and dry matter in both seasons. Application of 75 kg N/fed resulted in higher values than other treatments in seed germination %, relative density and dry matter. However, EC values were decreased with the some treatments. The increase in germination % with N application may be due to increases in grain volume, weight and kernel size of wheat as pointed out by Ottman *et al*. (2000). These results are in agreement with those found by Warreich *et al*. (2002), Hasina *et al*. (2012) and Haile and Nigussise-Dechassa (2013).

Highly significant differences were detected among the tested wheat cultivars regarding to EC (µmhos/g), Germination percentage, Relative density as well as Dry matter % in both seasons Table (5). Misr 3 cultivar was superior in germination%, Relative density as well as Dry matter % in both seasons. However, Misr 3cultivar gave the lowest values in EC trait in both seasons. From the above mentioned results it could be noticed that the differences in germination %, EC and chemical composition might be due to the genetic differences among cultivars. Genetic variability of cultivars resulted in differences in the values of seed quality parameters. These results are in accordance with those obtained by Hasina *et al*. (2012).

**Table 5. Effect of different nitrogen levels on EC ( µmhos/g), germination %, relative density and dry matter % of thirty eight wheat cultivar during 2018/2019 and 2019/2020 seasons.**

| Characters | EC ( µmhos/g) | | Germination % | | Relative density | | Chemical composition Dry matter % | |
|---|---|---|---|---|---|---|---|---|
| Seasons / Treatment | 2018/19 | 2019/20 | 2018/19 | 2019/20 | 2018/19 | 2019/20 | 2018/19 | 2019/20 |
| A:Nitrogen level (N) | | | | | | | | |
| 50 kg N/fed. | 12.92 | 11.17 | 92.42 | 92.00 | 1.65 | 1.13 | 86.17 | 85.06 |
| 75 kg N/fed. | 9.27 | 8.76 | 95.87 | 94.58 | 3.81 | 3.25 | 89.03 | 87.23 |
| L.S.D. at 5% | 0.95 | 0.77 | 2.48 | 2.29 | 0.35 | 0.23 | 0.81 | 0.73 |
| B: Cultivars (C) | | | | | | | | |
| Giza 139 | 13.75 | 13.18 | 79.18 | 78.90 | 1.33 | 1.19 | 83.12 | 82.97 |
| Giza 155 | 11.47 | 10.97 | 82.30 | 81.87 | 1.29 | 1.11 | 84.59 | 84.47 |
| Giza 156 | 12.61 | 12.43 | 80.51 | 80.07 | 2.10 | 1.96 | 85.23 | 84.95 |
| Giza 157 | 10.32 | 10.01 | 85.02 | 84.75 | 1.25 | 1.07 | 83.19 | 83.04 |
| Giza 160 | 10.01 | 9.75 | 83.49 | 83.32 | 1.22 | 1.13 | 83.25 | 82.93 |
| Giza 162 | 8.19 | 8.00 | 84.27 | 84.12 | 2.13 | 2.00 | 84.74 | 84.59 |
| Giza 163 | 8.77 | 7.76 | 86.10 | 85.96 | 1.19 | 1.09 | 85.45 | 85.34 |
| Giza 164 | 9.59 | 9.30 | 84.62 | 84.50 | 3.00 | 2.93 | 86.29 | 85.91 |
| Giza 168 | 7.10 | 6.95 | 95.33 | 95.24 | 6.21 | 5.89 | 89.42 | 89.25 |
| Giza 171 | 7.98 | 7.37 | 95.84 | 95.77 | 6.47 | 6.36 | 89.29 | 88.96 |
| Sakha 8 | 13.07 | 12.82 | 79.32 | 79.19 | 1.19 | 1.14 | 84.60 | 84.32 |
| Sakha 61 | 11.41 | 11.02 | 82.41 | 82.30 | 2.10 | 1.97 | 86.57 | 86.45 |
| Sakha 69 | 8.87 | 8.59 | 80.11 | 79.97 | 1.17 | 1.15 | 85.32 | 84.89 |
| Sakha 92 | 9.94 | 9.62 | 84.70 | 84.63 | 2.15 | 2.10 | 88.00 | 87.93 |
| Sakha 93 | 7.52 | 7.32 | 93.31 | 93.21 | 4.45 | 4.29 | 88.63 | 88.57 |
| Sakha 94 | 6.83 | 6.28 | 94.00 | 93.94 | 5.66 | 5.38 | 88.96 | 88.79 |
| Sakha 95 | 6.45 | 6.03 | 94.31 | 94.19 | 5.73 | 5.59 | 89.10 | 88.90 |
| Gemmeiza 1 | 13.32 | 13.11 | 79.55 | 79.35 | 1.15 | 1.12 | 84.51 | 84.12 |
| Gemmeiza 3 | 8.65 | 8.24 | 83.37 | 82.90 | 1.12 | 1.09 | 85.61 | 85.56 |
| Gemmeiza 5 | 11.22 | 10.96 | 85.22 | 84.97 | 3.13 | 3.05 | 84.33 | 83.98 |
| Gemmeiza 7 | 7.63 | 6.94 | 92.48 | 92.29 | 4.52 | 4.46 | 88.15 | 87.88 |
| Gemmeiza 9 | 7.55 | 6.89 | 92.85 | 92.52 | 4.65 | 4.57 | 88.57 | 88.41 |
| Gemmeiza10 | 6.16 | 5.84 | 94.52 | 93.88 | 5.81 | 5.65 | 89.19 | 88.79 |
| Gemmeiza11 | 6.50 | 6.28 | 93.58 | 92.97 | 5.29 | 5.17 | 88.65 | 88.50 |
| Gemmeiza12 | 6.31 | 6.00 | 94.67 | 94.59 | 6.03 | 5.80 | 89.31 | 89.01 |
| Sids 1 | 8.72 | 8.21 | 80.39 | 80.26 | 2.19 | 2.00 | 84.27 | 83.92 |
| Sids 4 | 12.24 | 12.04 | 83.19 | 82.93 | 2.19 | 2.13 | 83.70 | 83.47 |
| Sids 6 | 9.93 | 9.81 | 85.44 | 85.35 | 3.15 | 2.96 | 86.42 | 86.16 |
| Sids 7 | 11.73 | 11.64 | 88.17 | 87.92 | 3.19 | 3.14 | 84.16 | 83.89 |
| Sids 12 | 6.91 | 6.15 | 93.87 | 93.65 | 5.00 | 4.83 | 87.50 | 87.36 |
| Shandweel 1 | 9.02 | 8.71 | 92.92 | 91.89 | 4.87 | 4.72 | 88.41 | 88.26 |
| Hindi 62 | 12.03 | 11.83 | 82.00 | 81.84 | 1.10 | 1.07 | 85.13 | 84.97 |
| Mabrook | 11.56 | 11.19 | 83.15 | 82.91 | 1.12 | 1.09 | 84.04 | 83.80 |
| Sohag 3 | 9.33 | 8.87 | 85.74 | 85.55 | 4.00 | 3.90 | 86.11 | 85.78 |
| Bani Suef 1 | 10.15 | 9.90 | 92.22 | 91.83 | 4.27 | 4.22 | 88.36 | 87.77 |
| Misr 1 | 6.11 | 5.88 | 96.00 | 95.89 | 6.79 | 6.68 | 89.57 | 89.44 |
| Misr 2 | 6.84 | 6.27 | 95.04 | 94.77 | 5.13 | 5.08 | 88.79 | 88.56 |
| Misr 3 | 5.42 | 5.13 | 96.12 | 95.85 | 6.97 | 6.86 | 89.62 | 89.17 |
| L.S.D. at 5% | 3.85 | 3.53 | 5.17 | 4.82 | 2.79 | 2.43 | 4.92 | 4.71 |
| C: Interactions N × C | NS | NS | NS | NS | NS | NS | NS | NS |

**D: Disease assessment:**

A total of thirty eight wheat genotypes were tested for adult plant resistance to stripe, leaf and stem rust diseases as well as yield components Table (6). During 2018/19 growing season, data presented in Table (6) showed that, the stripe rust severity of the tested genotypes varied from 2.4 to 100% with infection type (MR, MS and S) under field conditions, that Misr-3 showed the best disease resistant with infection type (MR). While genotypes showed different infection types (MR, MS and S) with different disease severity ranged from 2 to 80% during 2019/20 growing season. Thirty seven wheat genotypes were susceptible to stripe rust disease during 2019 while three genotypes showed high disease resistant during 2020 growing season i.e. Misr-3, Giza 168 and Giza 171.

During 2018/19 growing Season, data presented in Table (6) showed that, the leaf rust severity of the tested genotypes varied from 0 to 40% with different infection types under field conditions. Out of 38 tested genotypes, 14 genotypes showed desirable/acceptable resistance to leaf rust, whereas rust severities ranged from 0 to R. Coefficient of infection (CI) in parallel line with rust severity, which gave values ranged from 0 to 0.2 (CI). While 12 genotypes gave resistant reaction ranged from 0 to MR. On the other hand 26 genotypes showed different infection types (MS and S) with different disease severity ranged from 2.4 to 60% during 2019/20 growing season.

Data in Table (6) showed that, stem rust severity and disease incidence were low, as well as the highest number of resistant genotypes were observed during *2018/19* season (26 genotypes) that showed infection type ranged from 0 to MR, whereas 12 genotypes showed infection type ranged from 3 to 50 %. Coefficient of infection was parallel line with rust severity. While during 2019/20 the stem rust severity of the tested genotypes varied from 0 to 60%. High rust severity was scored on 25 genotypes ranged from 8- 60% while 13 genotypes were observed resistant during this season.

Rust diseases of wheat not only reduce the yield but also reduce the grain quality. Using resistant wheat varieties will protect wheat production from disease infection and consequently from yield loss. In this study, 38 wheat genotypes were tested for its resistance to wheat stripe, leaf and stem rust. The tested genotypes were grown at El-Gemmiza Research Station during two growing

seasons i.e. 2018/19 and 2019/20. Data on rust incidence were recorded as rust severity (%) and coefficient of infection (CI) according to the equation adopted by Stubbs *et al*. (1986).

High yielding and resistant varieties are the main objectives of breeding program in Egypt, in this study wheat genotypes varied in their response to rust diseases and some of them showed high resistant against stripe rust specially in the second growing season i.e. Misr-3, Giza 168 and Giza 171 on the other hand 35 wheat genotypes were completely susceptible in wheat growing season 2019/20 and this due to the climate conditions, severity of rust races and time of infection. For leaf rust, During the two successive seasons twelve genotypes i.e.( Giza 164, Giza 168, Sakha95, Gemmeiza-12, Sids12, Sohag 3, Hendi 62, Mabrouk, Shandwel 1, Misr1, Misr2 and Misr3) showed high level of adult plant resistant to leaf rust which gave low rust severity (0-4). While in response to stem rust the results showed that, high resistant varieties against stem rust were (Giza 162,163, 168, 171, Sakha 95, Gemeiza-1, 3, 9, 10, 11, Mabrouk, Hendi 62, and Sohag3) in both wheat growing seasons. These wheat genotypes were resistant to rust diseases can be safely continue to use as commercial cultivars under Egyptian conditions and other cultivars should be evaluate again in wheat breeding program. Hussain *et al*. (2010-a) found that the score of leaf rust of the wheat variety Mairaj-08 varied from Tr to 10 MR, while it had 0 to Tr for yellow rust during 2005/06 to 2007/08. Also, Mairaj-08 had RRI value of 8 - 8.9 for leaf rust. Due to better adaptability of the wheat variety Mairaj-08 it has the potential to be approved as a new variety.

**Table 6. Average coefficient of infection of the tested wheat genotypes against rust diseases under natural conditions during 2018/19 and 2019/20 growing seasons.**

| Cultivars | Yellow rust | | | | Leaf rust | | | | Stem rust | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2018/19 | IT | 2019/20 | IT | 2018/19 | IT | 2019/20 | IT | 2018/19 | IT | 2019/20 | IT |
| Giza 139 | 60 | S | 40 | S | 20 | S | 40 | S | 0 | O | 8 | MS |
| Giza 155 | 50 | S | 20 | S | 30 | S | 50 | S | 0 | O | 10 | S |
| Giza 156 | 40 | S | 20 | S | 20 | S | 40 | S | 0 | O | 5 | S |
| Giza 157 | 60 | S | 40 | S | 40 | S | 60 | S | 2 | MR | 10 | S |
| Giza 160 | 50 | S | 20 | S | 30 | S | 40 | S | 0 | O | 8 | MS |
| Giza 162 | 40 | S | 20 | S | 10 | S | 10 | S | 0 | O | 2 | MR |
| Giza 163 | 50 | S | 30 | S | 40 | S | 60 | S | 0 | O | 2 | MR |
| Giza 164 | 40 | S | 20 | S | 0 | O | 0.2 | R | 3 | S | 20 | S |
| Giza 168 | 24 | MS | 2 | MR | 0 | O | 4 | MR | 0 | O | 2 | MR |
| Giza 171 | 2.4 | TRMS | 4 | MR | 4 | MS | 8 | MS | 0 | O | 4 | MR |
| Sakha 8 | 50 | S | 30 | S | 9 | SMS | 24 | MS | 0 | O | 3 | S |
| Sakha 61 | 70 | S | 40 | S | 10 | S | 30 | S | 0 | O | 5 | S |
| Sakha 69 | 40 | S | 20 | S | 30 | S | 50 | S | 3 | S | 10 | S |
| Sakha 92 | 70 | S | 40 | S | 30 | S | 60 | S | 0 | O | 8 | MS |
| Sakha 93 | 40 | S | 20 | S | 20 | S | 30 | S | 3 | S | 5 | S |
| Sakha 94 | 30 | S | 10 | S | 8 | MS | 5 | S | 0 | O | 3 | S |
| Sakha 95 | 10 | S | 5 | S | 0.2 | R | 1.2 | TRMR | 0 | O | 0 | O |
| Gemmeiza 1 | 40 | S | 20 | S | 16 | MS | 32 | MS | 0 | O | 2 | MR |
| Gemmeiza 3 | 70 | S | 40 | S | 0 | O | 2.4 | TRMS | 0 | O | 4 | MR |
| Gemmeiza 5 | 40 | S | 20 | S | 20 | S | 30 | S | 10 | S | 40 | S |
| Gemmeiza 7 | 50 | S | 30 | S | 30 | S | 50 | S | 0 | O | 10 | S |
| Gemmeiza 9 | 50 | S | 30 | S | 30 | S | 40 | S | 0 | O | 0 | O |
| Gemmeiza10 | 16 | MS | 4 | MS | 4 | MS | 5 | S | 0 | O | 0 | O |
| Gemmeiza11 | 100 | S | 80 | S | 30 | S | 50 | S | 0 | O | 0 | O |
| Gemmeiza12 | 40 | S | 20 | S | 0 | O | 0.2 | R | 0 | O | 5 | S |
| Sids 1 | 60 | S | 30 | S | 30 | S | 60 | S | 3 | S | 10 | S |
| Sids 4 | 70 | S | 40 | S | 30 | S | 50 | S | 10 | S | 40 | S |
| Sids 6 | 60 | S | 30 | S | 20 | S | 40 | S | 20 | S | 30 | S |
| Sids 7 | 70 | S | 40 | S | 20 | S | 30 | S | 10 | S | 20 | S |
| Sids 12 | 100 | S | 80 | S | 0 | O | 0 | O | 10 | S | 10 | S |
| Misr 1 | 50 | S | 30 | S | 0 | O | 0 | O | 50 | S | 60 | S |
| Misr 2 | 70 | S | 50 | S | 0 | O | 0 | O | 50 | S | 60 | S |
| Misr 3 | 2 | MR | 0 | O | 0 | O | 0 | O | 3 | S | 10 | S |
| Shandweel 1 | 40 | S | 20 | S | 0.2 | R | 4 | MR | 0 | O | 3 | S |
| Hindi 62 | 50 | S | 20 | S | 0 | O | 0 | O | 0 | O | 4 | MR |
| Mabrook | 50 | S | 30 | S | 0 | O | 0 | O | 0 | O | 2 | MR |
| Sohag 3 | 20 | S | 10 | S | 0 | O | 0 | O | 0 | O | 0 | O |
| Bani Suef 1 | 20 | S | 10 | S | 0 | O | 4 | MS | 2 | MR | 8 | MS |
| LSD 0.05 | 0.0015*** | -- | 0.003*** | -- | 0.003*** | -- | 0.006*** | -- | 0.046*** | -- | 0.061 | -- |

**IT: Infection type**

Hussain *et al*. (2010-b) reported that the rust score of Fareed-06 varied from 5 R to 10 MS for leaf rust and 10 MR/MS to 10 MS for yellow rust as compared to 70 S to 100 S for leaf rust and 50 S to 90 S for yellow rust of the check variety *i.e.* Morocco. Fareed-06 had RRI value of 8 for leaf and yellow rust. The wheat variety Fareed-06 was approved and released by Punjab seed Council, Lahore as new variety for cultivation in irrigated areas of Punjab. Hussain *et al*. (2013) showed that the rust score of the cv. AaS-2011 varied from 10 R to 30R/ MR for leaf rust and 10 R to 20 MR/MS for yellow rust as compared to 20 S to 90 S for leaf rust and 10 S to 90 S for yellow rust of the check variety *i.e.* Morocco. AaS-2011 had RRI value of 7.2 to 9 and 7.5 to 9 for leaf and yellow rust respectively. The cv. AaS-2011, were approved by Punjab seed Council, Lahore and released as a new variety for general cultivation in hot and drought areas of Punjab.

In 2013/2014 growing season, stripe rust appeared at late time (5/3/2014) showed lower yield loss in the two components compared with the next season. Loss % in grain yield was in parallel line with stripe rust severity, which ranged from (2.71%-32.8%) with 1000-kernels weight and (6.61%-35.54%) with plot weight (Hasan M.A. *et al*. 2016). Genetic resistance is the most economic and effective means of reducing yield losses causing by the disease. Using resistance genes to rust disease is the most economical, effective practice, and sustainable disease management strategy (Gad *et al*. 2020).

Mahmud *et al*. (2013) reported that the rust score of Chakwal-50 varied from 5 MR/MS to 30 MS for leaf rust and 5 MS to 30 MS for yellow rust. Also, the cv. Chakwal-50 had RRI value of 7 to 8.6 and 8 to 8.3 for leaf and yellow rust respectively. The cv. Chakwal-50 has the potential to be approved and released as a new variety. Tariq *et al*. (2013) showed that the rust score of the cv. Dharabi-11 varied from 0 to 5 S for yellow rust as compared to 80 S to 90 S for yellow rust of the check variety Morocco. The cv. Dharabi-11 had RRI value of 8.8 for yellow rust. The cv. Dharabi-11 was adapted at different locations, also it has the potential to be approved and released as a new variety. Akhtar *et al*. (2002) found that seven promising candidate lines *i.e*. NR-149, 95C004, 91BT010-5, V-97112, SD1200/14, B96038 and B92044 had desirable / acceptable RRI for leaf rust. So these lines can be recommended in those areas where rust problem leaf.

Rattu *et al*. (2009) showed that out of 29 candidate lines, three lines were found resistant to both leaf and yellow rusts and showed desirable RRI during 2003/04 and 2004/05. Worku *et al*. (2012) reported that out of the tested entries, 132 exhibited combined resistances to stem and leaf rust diseases and those were selected for further test in the 2010 off-season. In the subsequent test, 28 lines were identified to have high level of stem rust resistance comparable or better than the resistant checks. The selected durum landraces could be exploited in wheat breeding program.

To increase the wheat production in Egypt the breeding programs must be selected for yield and disease resistant like the traits studied in this investigation. Data on these regards showed that 3 wheat genotypes gave the highest values of yield trial and disease resistant, i.e. (Misr-3, Giza 168 and Giza 171) during the two successive seasons.

## CONCLUSION

According to this study, it can be suggested that Misr 3 was appropriate cultivar to be cultivated under using 75 kg N/fed, for achieving high yield and its components of wheat with good quality of seed and high resistant against rust diseases under Gemmeiza zone condition.

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## دراسة بعض الصفات المحصوليه والتكنولوجيه لبعض أصناف القمح تحت تأثيرمستويات مختلفه من التسميد النيتروجينى ومدى تأثرها بأمراض الصدأ

**عصام الدين معوض علي جبريل[١] ، محمد عمرالفاروق محمد[١] و محمد عبد الله أبو العنين جاد[٢]**

**[١]قسم بحوث القمح - معهد بحوث المحاصيل الحقلية - مركز البحوث الزراعية - مصر**

**[٢]قسم بحوث امراض القمح - معهد بحوث أمراض النباتات - مركز البحوث الزراعية - مصر**

أجريت هذه الدراسة في المزرعه البحثيه بمحطةِ البحوث الزراعية بالجميزه- مصرخلال موسمي ٢٠١٨ /٢٠١٩ و٢٠١٩ / ٢٠٢٠ لدراسة تأثير مستويان من التسميد الازوتي (٥٠ و ٧٥ كجم أزوت / فدان) علي بعض الصفات المحصوليه و التكنولوجيه لثمانيه وثلاثون من أصناف القمح. و كان التصميم المستخدم هو القطع المنشقه مره واحده حيث إحتوت القطع الرئيسيه على معاملات التسميد الآزوتي ووضعت الأصناف في القطع المنشقة. وتتلخص أهم النتائج المتحصل عليها فيما يلي: كان لزيادة التسميد الآزوتي تأثير معنوي علي كل الصفات تحت الدراسة في كلا الموسمين. و قد أعطت معاملة التسميد الآزوتي ٧٥ كجم/ فدان أعلي محصول حبوب وعدد الايام حتى الطرد وعدد الايام حتى النضج وطول النبات و عدد الحبوب بالسنبله و عدد السنابل/م٢ ووزن ال ١٠٠٠ حبه ونسبة الانبات والكثافه النسبيه والماده الجافه في كلا الموسمين عن معاملة التسميد الآزوتي ٥٠ كجم/ فدان بينما تناقصت قيمة التوصيل الكهربى نتيجة زيادة معدل التسميد الازوتى من ٥٠ الى ٧٥ كجم/نتيروجين/فدان. تفوق الصنف مصر٣ على باقى الاصناف فى صفات محصول الحبوب وعدد السنابل/م٢ و نسبة الانبات والكثافه النسبيه والماده الجافه وذلك تحت مستوي تسميد أزوتي ٧٥ كجم/فدان. بينما سجل الصنف مصر٢ أعلى قيم لصفات عدد الايام حتى الطرد وعدد الايام حتى النضج وطول النبات في كلا الموسمين. توصى هذه الدراسه بزراعة الصنف مصر٣ مع التسميد النيتروجينى بمعدل٧٥ كجم للفدان للحصول علي أعلي إنتاجيه لمحصول القمح و مكوناته مع أفضل جوده للحبوب وكذلك مقاومته لأمراض الأصداء وذلك تحت ظروف منطقة وسط الدلتا.