

ISMAILIA2: A Newly Released High Yielding Peanut Cultivar for New Reclaimed Land

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Abstract: Ismailia 2, a new peanut cultivar released by Oil Crop Research Department, Field Crops Research Institute, ARC, Egypt in 2020, offers peanut growers a new choice for high yielding, and high seed oil percentage cultivar. Yield trials conducted during three successive growing summer seasons of 2016, 2017 and 2018 and 10 verification yield trials through the two growing seasons of 2019 and 2020. The results proved the superiority of the new cultivar Ismailia 2 over the commercial peanut cultivars.

Keywords: Peanut genotypes, verification yield, seed oil content, pod yield stability

INTRODUCTION

Groundnut or Peanut (*Arachis hypogaea* L.), is an important oil food legume crop. It is a principal economic crop and occupies prominent position among edible oil seed crops in Egypt. It is not only rich source poly unsaturated fatty acid (oleic acid and linolic acid) but also, possess good quality protein, minerals and vitamins. While higher oleic acid content provides thermal stability and makes it suitable for deep frying, higher linoleic acid is good for health. It is rich in fat and protein. Thus, it is a cheap source of nut rive food for human to overcome the protein energy malnutrition. In Egypt, it is considered export crops. Whereas 30000-50000 ton is exported annually to Europe. The develop and grow real peanut cultivars having high yielding and oil ability in new reclaimed land is the main target to peanut breeders in oil crops Research department, Field Crops Research Institute, Agriculture Research center. To a chive this goal, developing new cultivars tolerant to biotic and a biotic stresses and high yielding and oil content are highly needed, following this strategy, many cultivars have been developed by oil crops Research department such as Gregory (1962) followed selection method for releasing new varieties. El Ahmer and El-mandoh (1983) reported the results of 17 yield trails and selected the new variety Giza/5 which over yielded the commercial one Giza/4 of unshelled nuts by 30.17%, El Mandoh *et al.* (1996) developed the other new cultivar Giza/7 by selection in hybrid progeny lines. This cultivar over yielded the check cultivar Giza/4 by 11.05, 8.23 and 17.94% in preliminary (A), advanced(B) and verification trails(D), respectively.

Attia *et al.* (2006) reported the result of 20 yield trails carried out in 3 successive seasons in three locations. They developed the new cultivar Giza/8 which over yielded the commercial cultivar Giza/4 by 1.53 ardab/feddan. The genotype (G) x environment (E) interaction provides information on genotypes for their stability over wide agro-climatic conditions. The environmental influence on phenotypic expression of

variety can easily be identified by growing it under different environments and locations John *et al.* (2009) and Aroglu *et al.* (2011). The peanut stability was studied by may Researches. Malik *et al.* (2009) evaluated eight promising genotypes of groundnut for their stability at ten locations. They stated that analysis of variance revealed highly significant genotype x location. Souina *et al.* (2016) studied Genotype by Environment Interaction for thirteen peanut in three locations. They found that combined analysis of variance showed significant differences between genotypes. Rathna Kumar *et al.* (2020) found that significant genotype and genotype x environment for disease resistance and yield parameters. Significant genotype by environment interaction effect suggested the need to identify location specific breeding lines to a chive gain in pod yield

The present study was aimed to develop new peanut cultivar resistance to peanut disease and has high yielding and oil content under different environment conditions of Egypt.

MATERIALS AND METHODS

The new cultivar Ismailia 2 was selected from cross Gregory X line 98 using the pedigree method at Ismailia Agriculture Research Station, Egypt and the selection history is 2007.

Three levels of yield trails were carried out to evaluate the new cultivar Ismailia 2 they started from 2016 to 2020 growing seasons as follows:

Preliminary yield trials

The newly released cultivar Ismailia2 was evaluated for seed yield and quality traits ability against 15 promising local and accession lines including commercial cultivar Giza/6 are presented in Table (1). These promising lines were grown at four research stations representing different ecological zones peanut growing regions. Ismailia (East delta), Shandweal, Matana and Toska (Upper Egypt) in 2016 season (one

experiment for each location). The preliminary yield trials were evaluated in randomized complete block design (RCBD) with three replications. Each line was grown in a plot consisting of five rows, 4 meters long,

distance between rows was 60 cm and distance between plants within row was 20cm, with one plant per hill. All cultural practices were done according to recommended methods.

Table (1): The name and origin of the genotypes included in the preliminary yield trail

No.	Name	Origin
1	Genotype 102	Egypt
2	Genotype 7	Egypt
3	Genotype 410	India
4	Genotype 9	Egypt
5	Genotype 110	Egypt
6	Genotype 133	Egypt
7	Genotype 29A	Egypt
8	Genotype 2A	Egypt
9	Genotype 21A	Egypt
10	Genotype 72	Egypt
11	Genotype 19A	Egypt
12	Genotype 8A	Egypt
13	Genotype 40A	Egypt
14	Genotype 32A	Egypt
15	Genotype/ 6	Egypt Commercial cultivar(check)
16	Ismailia 2	Egypt

Advanced yield trails

Ismailia 2 were tested for yielding and seed quality in the advanced yield trail against four genotypes trails and the commercial cultivar Giza/6, in the two growing summer season of 2017 and 2018 (Table 2). The new Ismailia 2 was tested in the advanced yield trails at four locations, Ismailia (East delta), Shandweel, Matana and Toshka (Upper Egypt). In these advanced yield trail, all genotypes evaluated in a randomized complete block design (RCBD) with three replications. Each genotype was grown in plot consisting of 10 rows, 4meters long, distance between rows was 60cm and distance between plants within rows was 20cm, with one plant per hill. The cultivar practices were according to recommended methods.

Table (2): Name of genotypes in the advanced yield trail

No	Name
1	Genotype 410
2	Genotype 29A
3	Genotype 72
4	Genotype 8A
5	Giza/6
6	Ismailia 2

Verification yield trail

Verification yield trail was carried out on farmers, field in old and new reclaimed land during the two successive growing seasons of 2019 and 2020 including

the new released cultivar and commercial cultivar at four locations Beherea, Nubaria, Sharkia, Ismailia and Sohag. The cultivar practice was done as recommendation packages for peanut according the region.

Statically analysis

In the three levels of the experiments, ten guarded plants were randomly select from each plot record number of pods/plant, shelling percentage (%) and seed oil content percentage (%). In addition, all experimental areas were harvested weighted and the yield was adjusted to ardab/faddan. The analysis of locations was made according to the technique outlined by Stell *et al.* (1997). Stability parameters for pod yield of eight yield trials (advanced yield trials) were calculated according to Eberhart and Russell (1966). The morphological characteristics of Ismailia 2 were performed by Union for the Protection of new Varieties of Plants (UPOV).

RESULTS AND DISCUSSION

1- Pod yield in Preliminary trials

The data in Table (3) showed the results of the preliminary yield trials in ard/fed. of the new released peanut cultivar Ismailia 2 and fifteen peanut genotypes in 2016 growing season in four regions. The new cultivar had the highest pod yield (ard/fed.) giving 27.8, 24.6, 24.9 and 23.8 (ard/fed.) respectively, with a general mean of 25.3(ard/fed.), whereas, Giza/6 it was 20.7, 21.6, 21.8 and 16.4 (ard/fed.) respectively with a general mean of 20.1(ard/fed.).

Data revealed that the Ismailia2 exceed the commercial cultivar Giza/6 by 34.3%, in Ismailia (East delta). Meanwhile in Upper Egypt Ismailia2 surpassed commercial cultivar (Giza/6) by 13.9%, 14.2% and 39.0% in Shandweel, Matana and Toshka, respectively.

The lowest increase was recorded in Shandweel (13.9%).

These results reflect the newly peanut cultivar Ismailia2 has high yielding ability and good adaptability to be cultivar in real reclaims lands of Egypt

Table (3): Pod yield (ardab/faddan) of the new cultivar Ismailia 2 and 15 peanut promising genotypes preliminary yield trial

Genotypes	Location				Mean
	East Delta	Upper Egypt			
	Ismailia	Shandaweel	Mtana	Toshky	
1	15.9	18	20.7	17.5	18.0
2	14.4	18.2	21.4	16.3	17.6
3	19.2	22	21.7	19.7	20.7
4	16.6	18	17.5	16.5	17.2
5	14.8	20.9	20	19.4	18.8
6	19.5	20.5	21.5	20.5	20.5
7	21.8	23.3	21.7	17.4	21.0
8	17.1	20	20.8	21.5	19.9
9	15.8	18	17.9	16.3	17.0
10	20.8	21	16.3	19.6	19.4
11	15.7	18.8	20.2	19.8	18.6
12	22.8	23.5	21.4	19.7	21.9
13	15.5	17.3	21.7	20.5	18.8
14	20.4	20.5	22.7	21.5	21.3
15	20.7	21.6	21.8	16.4	20.1
Ismailia 2	27.8	24.6	24.9	23.8	25.3
Mean	18.7	20.4	20.8	19.2	
L.S.D	0.5	1.0	0.7	0.8	

2- Pod yield in the advanced yield trail

Table (4) shows pod yield (ardab/faddan) of new cultivar Ismailia 2 and 5 peanut promising lines in advanced trails during 2017 growing season in East Delta and Upper Egypt. Pod yield of the new peanut cultivar was higher than all other lines in East Delta and Upper Egypt. The new cultivar Ismailia2 was higher than the commercial cultivar by 33.5% in Ismailia (East Delta). Meanwhile, in Upper Egypt Ismailia2 was higher than the commercial cultivar Giza/6 by 11.1%, 23.1% and 9.4% in Shandweel, Matana and Toshka, respectively. Ismailia2 had the highest pod yield in Ismailia (26.7ard/fadd) and Toshka (23.3ard/fad). These result revealed that the new cultivar could be grown in new reclaim land. The pod yield (ard/fad)and of new cultivar Ismailia2 and 5 peanut promising lines in advanced yield trails during the second season (2018)

are presented in Table (5). Pod yield ranged from 18.1 to 28.8ard/fad with mean 21.9 ard/fad in Ismailia (East Delta), from 17.0 to 22.0 ard/fad with mean 19.8ard/fad in Shandwell from 17.9 to 22.0 ard/fad with mean 19.5 ard/fad in Matana and from 17.2 to 21.0 ard/fad with mean 19.6 ard/fad. Pod yield of Ismailia2 was 1.4, 1.1, 1.1 and 1.1 times the pod yield obtained from commercial cultivar Giza/6 in Ismailia (East Delta), Shandweel, Matana and Toshka (Upper Egypt), respectively. Ismailia 2 gave higher pod yield in Ismailia in both 2017 and 2018. In contrast it gave lowest pod yield in Toshka in 2018 season.

The pod yield over two successful growing seasons 2017 and 2018 are shown in (Table 6). The mean pod yield of new released cultivar Ismailia2 was 23.3ard/fad. Its productivity out yielded the mean of the commercial cultivar 19.8ard/fad by 17.7%.

Table (4): Pod yield (ardab/faddan) of the new cultivar Ismailia2 and 15 promising genotypes in advanced yield trials in 2017 growing season

Genotypes	Locations				Mean
	East Delta	Upper Egypt			
	Ismailia	Shandaweel	Mtana	Toshky	
1	22.3	17.8	16.4	16.0	18.1
2	24.7	18.8	16.9	19.9	20.1
3	23.0	17.8	19.7	21.3	20.4
4	21.7	15.9	20.7	19.2	19.1
5	20.0	19.0	17.3	21.3	19.4
Ismailia 2	26.7	21.1	21.3	23.3	23.1
Mean	23.1	18.4	18.7	20.2	
L.S.D	0.8	1.7	0.5	0.6	

Table (5): Pod yield (ardab/faddan) of the new cultivar Ismailia2 and 5 peanut promising genotypes in the advanced yield trials in 2018 growing season

Genotypes	Location				Mean
	East Delta	Upper Egypt			
	Ismailia	Shandaweel	Mtana	Toshky	
1	21.9	18.6	17.9	17.2	18.9
2	20.0	21.1	19.2	20.3	20.1
3	18.1	17.0	19.3	20.3	18.7
4	22.5	19.5	18.1	18.8	19.7
5	20.0	20.3	20.7	19.7	20.2
Ismailia 2	28.8	22.0	22.0	21.0	23.4
Mean	21.9	19.8	19.5	19.6	
L.S.D	0.570	0.628	0.364	0.373	

Table (6): Average pod yield (ard/fad) for Ismailia 2 and the check commercial cultivar over the two growing season of 2017 and 2018

Average pod yield	Growing season		Mean
	2017	2018	
Commercial cultivar	19.4	20.2	19.8
Ismailia2	23.1	23.4	23.3

3- Verification yield trails

Table (7) shows the mean pod yield of Ismailia 2 and commercial cultivar Giz/6 in 5 on-farm yield trails were sown in 5 governorates viz. Beherea, Sharkia and Sohag (old land) and Nubaria and Ismailia (new land) in 2019 growing season. In Behera (west delta), Sharkia (East Delta) and Sohag (Upper Egypt), the mean of Ismailia2 was higher by 19.3%, 24.5% and 22.7%, respectively. Over the mean of Giza/6. However in new land at Nubaria (West delta) and Ismailia (East Delta) the mean yield of Ismailia2 was higher than Giza/6 by 12.1% and 20.9%, respectively. The results of the verification yield trails confirmed the results of the advanced yield trails, where the new cultivar Ismailia 2

performed well in all cultivar. The new peanut cultivar Ismailia 2 was continuously evaluated in 5 on-farm trails in five governorate viza, Behera, Sharkia, Sohag (Old land), Nubaria and Ismailia (New land) during 2020 growing season (Table 8). Data revealed that the pod yield of Ismailia2 was higher than the commercial cultivar Giza/6 by 8.91%, 12.1%, 23.5%, 4.3% and 27.1%, respectively. In general from previous results of the yield trails, at the national level the new cultivar Ismailia2 had a higher pod yield than the promising lines and commercial cultivar in all level of yield trails. From the results of verification yield trails in 2019 and 2020 season the new cultivar was performed well and produced high pod yield under the old reclaim land.

Table (7): Pod yield (ardab/faddan) of the new cultivar Ismailia 2 and the commercial cultivar Giza/6 in verification yield trial in 2019 growing season

Region	Governorate	Ismailia2	Giza/6
West delta	Beherea	25.3	21.2
East delta	Sharkia	25.4	20.4
Upper Egypt	Souhag	24.3	19.8
Old land mean		25.0	20.5
West delta	Nubaria	26.0	23.2
East delta	Ismailia	27.2	22.5
New land mean		26.6	22.9
Over all mean		25.6	21.4

Table (8): Pod yield (ardab/faddan) of the new cultivar Ismailia 2 and the commercial cultivar Giza/6 in verification yield trial in 2019 growing season

Region	Governorate	Ismailia2	Giza/6
West delta	Beherea	24.6	22.6
East delta	Sharkia	23.2	20.7
Upper Egypt	Souhag	23.1	18.7
Old land mean		23.6	20.6
West delta	Nubaria	24.0	23.0
East delta	Ismailia	26.7	21.0
New land mean		25.4	22.0
Over all mean		24.3	21.2

Oil percentage in advanced yield trails

Tables (9 and 10) indicated significant difference among genotypes and environments for the oil percentage for Ismailia 2 compared with fourteen promising genotypes and commercial cultivar in 2017 and 2018 season. Result in Table (9) showed that the genotype No.4 give the highest oil percentage recorded (55%), while Ismailia 2 recorded (52.7%) in East Delta,

regarding to Upper Egypt, Shandaweel genotypes No. 2 and 5 recorded (49.7, 49.3%), meanwhile Ismailia 2 recorded (49.0%). Regarding to Matana the highest oil percentage recorded (51.3, 50.3%). Ismailia 2 has good potentiality suited for different ecology condition. Table (10) showed the mean performance, Ismailia 2 had highest oil percentage in Upper Egypt, Shandaweel, Matana and Toshky.

Table (9): Oil content percentage of the new cultivar Ismailia 2 and 5 peanut promising genotypes in advanced yield trails during 2017 growing season

Genotypes	Locations				Mean
	East Delta	Upper Egypt			
	Ismailia	Shandaweel	Mtana	Toshky	
1	50.0	48.0	47.0	49.3	48.6
2	47.3	49.7	49.3	47.7	48.5
3	48.7	49.0	46.0	46.7	47.6
4	55.0	45.7	45.3	45.3	47.8
5	54.0	49.3	49.3	50.0	51.2
Ismailia 2	54.7	49.0	51.3	50.3	51.3
L.S.D	0.6	0.4	0.5	0.4	

Table (10): Oil content percentage of the new cultivar Ismailia 2 and 5 peanut promising genotypes in advanced yield trails during 2018 growing season

Genotypes	Locations				Mean
	East Delta	Upper Egypt			
	Ismailia	Shandaweel	Mtana	Toshky	
1	47.3	49.0	48.7	50.0	48.8
2	48.7	49.7	47.7	48.3	48.6
3	49.0	48.3	49.7	45.7	48.2
4	50.3	47.7	47.3	43.7	47.3
5	54.3	50.3	49.3	49.7	50.9
Ismailia 2	52.7	51.3	50.7	51.7	51.6
L.S.D	0.6	0.5	0.5	0.6	

Pod yield stability

Stability parameters for pod yield of eight yield trials (advanced yield trials) were calculated according to Eberhart and Russell (1966). The stable genotypes was defined as one which had a high average performance over a wide range of environments, and the regression coefficient is equal to one and deviation from regression mean square not significantly different from zero. The results in Table (11) revealed that the new peanut cultivar Ismailia 2 had good stability parameters in the two seasons. Therefore, the new variety could be recommended to be released and grow under wide range of environments.

Table (11): Pod yield (ardab/faddan) of advanced yield trials of Ismailia2 and five high yielding check cultivar in 2018 and 2019 growing season

Genotypes	Pod yield	B	S2d
1	18.5	4.73	-25.66
2	20.1	0.76	-9.97
3	19.6	0.67	-11.27
4	19.4	1.40	-16.67
5	19.8	-4.33	-21.97
Ismailia 2	23.3	4.12	-26.55

b= Regression. S2d= Deviation from regression

Variety description of Ismailia 2 cultivar

The new released Ismailia2 cultivar is of spreading type has high yielding potentiality with good pod, seed characters and oil percentage. It is an early maturity variety compared with the check cultivar Giza/6, as it matures seeds after 100 days from sowing compared to 120 days for Giza/6. The description of the new accession to the Union Protection of Varieties (UPOV) could be summarized as follows:

1- Growth period. 100 days from emergence.

2- Growth characters.

- 2.1. Growth habit: semi spreading type.
- 2.2. Branching pattern: alternate.
- 2.3. Leaf color: green
- 2.4. Leaf shape: obovate

3- Pod characters.

- 3.1. Pod beak: prominent
- 3.2. Pod constriction: slight
- 3.3 No. of seeds/pod: almost two
- 3.4. 100-sound pod weight: 300gm

4- Seed characters:

- 4.1. 100-mature dry seed weight: 200gm
- 4.2. Seed color: red

Ismailia 2 is registered and seeds will be available to farmers before growing season 2021

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اسماعيلية ٢ صنف فول سوداني جديد عالي المحصول ونسبة الزيت للأراضي الجديدة

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إسماعيلية ٢ صنف جديد من الفول السوداني تم استنباطه بمحطة البحوث الزراعية بالإسماعيلية - قسم بحوث المحاصيل الزيتية. تم تقييم إسماعيلية ٢ في ١٢ تجريبه حقلية مصغره ومكبره في مناطق زراعه الفول السوداني في الوجه البحري والقبلي خلال ثلاث مواسم متتالية ٢٠١٦، ٢٠١٧ و ٢٠١٨، ثم تم تقييم الصنف الجديد إسماعيلية ٢ في ١٠ تجارب تأكيديه خلال المواسم ٢٠١٩ و ٢٠٢٠. أظهرت النتائج تفوق إسماعيلية ٢ على الصنف السائد المنزرع جيزة/٦ في كل المناطق تحت الدراسة. كما أكدت التجارب التأكيدية تفوق إسماعيلية ٢ على الصنف التجاري حيث بلغت إنتاجية ٢٥.٦ و ٢٤.٣ أردب/الفدان علي التوالي مقارنة بالصنف التجاري ٢٤.٣ و ٢٣.١ أردب/الفدان كما بلغت نسبة الزيت في الصنف الجديد إسماعيلية ٢ ٥١.٦ %.