Hybrid Rice In Egypt

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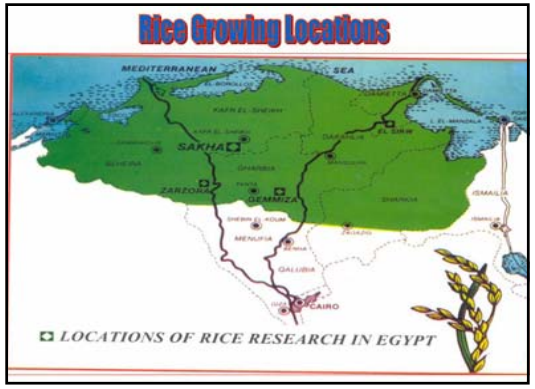
Rice in Egypt

Total area: 1.681 million fed.
Productivity: 4.106 tons/ fed.
Total production: 6.902 million tons

Egyptian Rice Production & Export

Year	Production Million tons	Export Million tons
1983/1984	2.400	0.000
1991/1992	3.41	0.200
1995/1996	4.82	0.350
1999/2000	5.34	0.320
2000/2001	6.00	0.332
2001/2002	5.40	0.755
2002/2003	6.10	0.322
2003/2004	6.04	0.619
2004/2005	6.18	1.100
2005/2006	6.55	1.102
2006/2007	6.12	1.294
2007/2008	6.74	*0.750

*Up to 1ST April, 2008



National Rice Research Program

A-Divisions

1- Breeding and seed production

2- Agronomy

3- Plant Protection (Disease, Insect, weeds)

4- Technology transfer

5- Biotechnology

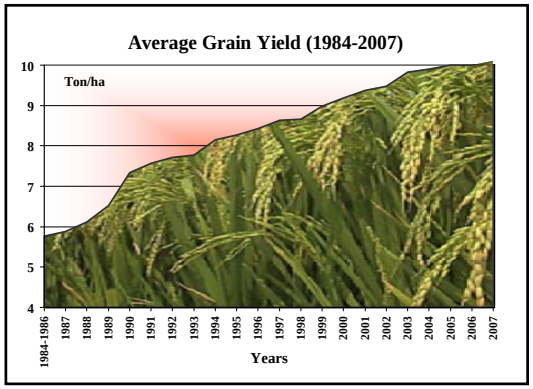
6- Economics

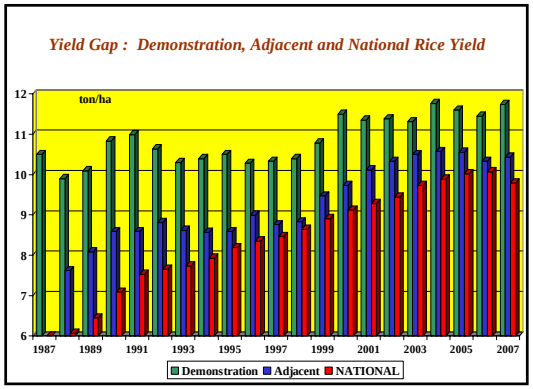
7- Mechanization

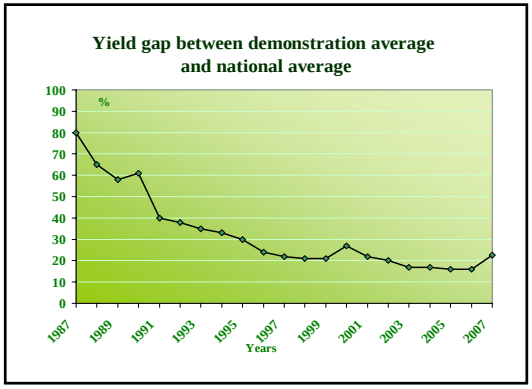
B- Staff

50 Scientists (PhD) covering various disciplines,

150 supporting, technical and administrative staff







OUR VISION

Key Elements for Breaking Yield Plateau :

***Maximization** of yield potentiality

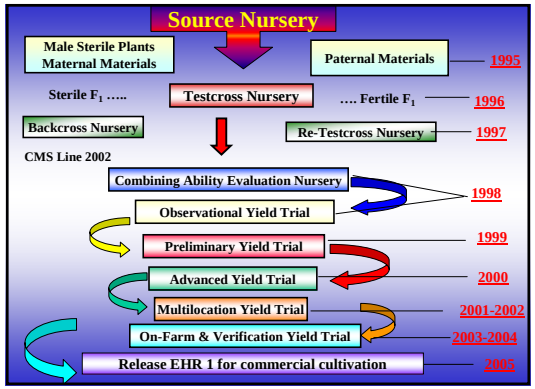
***Stabilization**

for diverse environmental conditions

***Optimization** of CNR Management

Objectives of Hybrid Rice Research in Egypt

- Development of hybrid with 15-30 % yield advantage over the highest yielding inbred/hybrid check varieties.
- To continue the pedigree nursery for important traits such as floral traits for CMS lines, restoring ability, and wide compatibility.
- Development of two-lines system hybrids
- Development of hybrid rice parental lines
- To Develop hybrid rice seed production technology.
- Optimize seed production package.
- Standardize production package for cultivation of hybrid.
- Training the human resources on hybrid rice technology.



Hybrid rice breeding and Seed production nurseries – 2007

1- Evaluation of Experimental Hybrids

Materials	# Entry/ cross	Remarks
•Advanced Yield Trial (AYT)	14 Entry	Replicated- 4 Locations
• Multilocation Yield Trial (MYT)	20 Entry	Replicated- 4 Locations
•Preliminary Yield Trial (PYT)	50Entry	Replicated- 1 Location
•Basmati Preliminary Yield Trial (BPYT)	26 Entry	Replicated- 1 Location
•Observational Yield Trial (OYT)	103 Entry	Augmented design

Promising hybrids in Advanced Yield Trials (AYT) 2007 season*

Hybrids/ Check	Yield (t/ha)	Y. Adv. t/ha	% SH (Sakha 101)	Remarks	Rank
SK 2034 H	12.55	2.16	20.80	Released	3
SK 2046 H	12.67	2.29	22.01	Under Released	2
SK 2035 H	11.97	1.58	15.23		7
SK 2058 H	11.42	1.03	9.90		8
SK 2003 H	12.21	1.82	17.54	Short grain	6
SK 2010 H	12.88	2.49	23.99		1
SK 2007 H	12.55	2.16	20.80		4
SK 2107 H	10.68	0.30	2.85	Aromatic	9
SK 2074 H	12.44	2.05	19.74	Salt Tolerance	5
Giza 177 (Inbred)	9.55				
Giza 178(Inbred)	10.17				
Giza 182 (Inbred)	10.32				
Sakha 101(Inbred)	10.39				
Sakha 104 (Inbred)	9.91				

*Under normal conditions (Sakha, Gemmiza and Zarzoura)

Promising hybrids identified in multi-location trials 2007 season

Hybrids/ Check	Yield (t/ha)	Y. adv. (t/ha) over Sakha 101	SH%	Y. adv. Over E.Yasmine	SH %	Remarks
SK 2034 H	12.46	2.14	20.73			Released
SK 2046 H	12.54	2.22	21.51			Under Released
SK 2003 H	12.60	2.28	22.09			Short grain
SK 2037 H	11.75	1.43	13.85	2.03	20.88	Aromatic
SK 2058 H	11.15	0.83	8.04			
SK 2107 H	10.43			0.71	7.30	Aromatic
SK 2096 H	10.88			1.16	11.93	Aromatic
SK 2122 H	12.53	2.21	21.41	2.81	28.91	Aromatic
SK 2108 H	10.89			1.17	12.04	Aromatic
SK 2065 H	10.99	0.67	6.49			
SK 2029 H	12.14	1.82	17.63			
SK 2121 H	12.61	2.29	22.19	2.89	29.73	Aromatic
SK 2010 H	12.65	2.33	22.58			
SK 2007 H	12.90	2.58	25.00			
Giza 178	10.05					
Sakha 101	10.32					
E. Yasmine	9.72					Aromatic

*Under normal conditions at three locations (Sakha, Gemmiza, and Zarzoura)

Promising hybrids in HR yield trials during 2007 season.

Rank	Hybrids/ Check	Yield (t/ha)	Yield advantage %	DDG (days)	Ht (cm)	1000-grain weight (g)	Grain type
1	SK 2010 H	12.77	23.27	130	118	28.3	M
2	SK 2007 H	12.73	22.88	132	119	28.0	M
3	SK 2046 H	12.61	21.72	135	116	26.3	M-Sh
4	SK 2034 H	12.51	20.76	134	112	24.6	M-Sh
5	SK 2003 H	12.41	19.80	135	120	26.0	Sh
6	SK 2074 H	12.20	17.76	128	112	26.9	M-Sh
Check	Sakha 101	10.36	-	140	100	25.9	Sh

Promising aromatic hybrids in HR yield trials, 2007 season.

Rank	Hybrids/ Check	Yield (t/ha)	Yield advantage %	DDG (days)	Ht (cm)	1000-grain weight (g)	Grain type
1	SK 2121 H	12.61	29.73	130	121	27.5	L
2	SK 2122 H	12.53	28.91	133	126	26.2	L
3	SK 2037 H	11.75	20.88	138	116	28.2	L
4	SK 2108 H	10.89	12.04	135	118	27.1	L
5	SK 2107 H	10.88	11.93	135	123	29.6	L
Check	E. yasmine	9.72	-	140	117	28.0	L

Promising hybrids in HR yield trials under saline condition during 2007 season.

Rank	Hybrids/ Check	Yield (t/ha)	Yield advantage %	DDG (days)	Ht (cm)
1	SK 2007 H	3.81	1.72	135	90
2	SK 2029 H	3.57	1.62	130	96
3	SK 2121 H	3.40	1.55	132	101
4	SK 2122 H	3.09	1.42	135	94
5	SK 2107 H	3.09	1.42	136	101
6	SK 2058 H	3.09	1.42	130	82
Check	Giza 178	2.09	CK	132	84

Promising Basmati Hybrids Identified, 2007 Season

Hybrid/Check	Yield t/ha	Yield Advantage %		Duration (days)	Milling %	Head Rice %	Amylose %
		Over E.Y.	Over PB.1				
SKPusa H1(SKPH1)	11.6	36.5	48.7	138	71	62.0	22.0
SKPusa H2 (SKPH2)	11.3	32.9	44.9	140	68	55.0	22.5
Egyptian Yasmin	8.5	CK	CK	150	65	49.0	24.0
Pusa basmati-1	7.8	CK	CK	145	69	51.0	24.0
PR1 (Restorer)	9.0	-	-	137	70	55.4	22.2
PR2 (Restorer)	8.6	-	-	136	71	56.2	22.8

All have a strong aroma

2- Identification and Development of Parental Lines

Materials	# Entry / Cross	Remarks
· Source Nursery (SN)	112 Entry	Hybridization
· Test cross Nursery (TCN)	130 Cross	Identification
· CMS Maintenance & Evaluation (CMSN)	53 Entry	Maintenance & Evaluation
· First Egyptian CMS Lines	32 Line	Maintenance & Evaluation
· Back cross Nursery (BCN)	180 Line	Produce BC_1, BC_2 and BC_3
· Combining Ability Nursery (CAN)	103 Entry	Evaluation
· Restoring Ability Nursery (RAN)	450 Line	Selection (F_1 to F_2)
Basmati Parental Lines	250 Lines	Selection
· Improvement of Parental Line	350 Line	Selection
· Wide Compatibility Nursery (WCN)	150 Line	Selection
· TGMS	78 Line	Selection
PGMS	142 Line	Selection

Best CMS adapted under Egyptian environment

CM line	Cyto-sterility source	Grain type	Amylose content (%)	Out-crossing (%)
1. SKMS1	WA	LS	15.8	28-45
2. SKMS4	WA	L	23.4	31-40
3. SKMS8	WA	M	22.9	29-57
4. SKMS9	WA	M	24.2	43-72
5. SKMS10	Gambiaca	Sh	21.2	28-59
6. SKMS11	WA	LS	21.5	18-37
7. SKMS12	WA	L	20.0	26-58

TGMS parental lines and gene/s transfer in Sakha during 2007 season

Generation	Planted		Selected	
	Crosses	Lines	Crosses	Lines
TGMS				
F_1	3	-	3	20
F_6	9	271	8	260
PGMS				
Auther culture	1	271	1	86
New PGMS	8	20	6	70

Effect of different methods and rates of potassium application on the productivity of hybrid rice (H1).

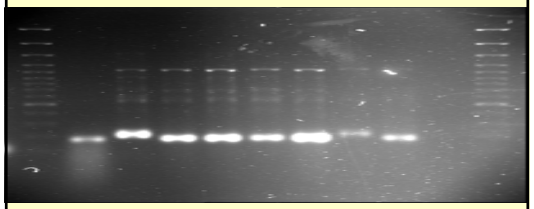
Treatments .	Grain yield
Control	9.07
57 kg K_2O ha^{-1} (B)	10.03
114 kg K_2O ha-1 (B)	10.39
57 kg K2O ha-1 (1/2B+ ¼ Mt+ ¼ Bt)	12.14
114 kg K2O ha-1 (1/2B+ ¼ Mt + ¼ Bt)	12.01
2% K2O Spray at Mt	9.93
2%K2O Spray at BT	9.97
2% K_2O_5 Spray at Mt + Bt	12.54
L.S.D.0.05	0.49

Hybrid Rice Biotechnology Activities

Total of 271 EGMS lines were developed using anther culture, out of which 15 are stable .

Evaluating the presence of S-8* gene in some Egyptian rice varieties

M Dular SK101 SK104 Giza178 Giza182 Giza181 SK103 SK102 M



***S-8 is one of the WCGs and located on chromosome 6 and linked to RM412**

Evaluating of Dular/Giza178 F_4 population for the presence of Restore ring ability and wide compatibility genes in a single line

Line Number	RF-1	RF-3	RF-4	S-5(WCG)	S-8(WCG)
1	+	+	-	+	+
2	+	+	-	+	+
3	+	+	-	+	+
4	+	+	-	+	+
5	+	+	+	+	+
Dular	+	-	+	+	+
Giza178	+	+	-	-	+

R. El Namaky, PhD Thesis, 2007

HR puriting test using biochemical markers

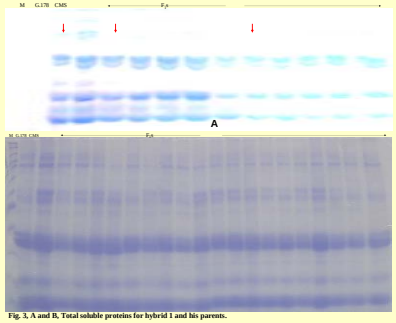
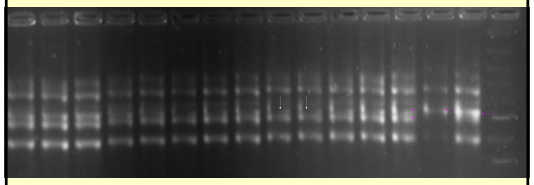


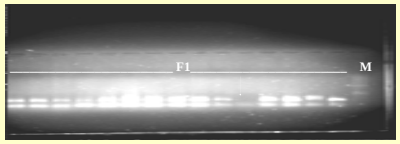
Fig. 3, A and B, Total soluble proteins for hybrid 1 and his parents.

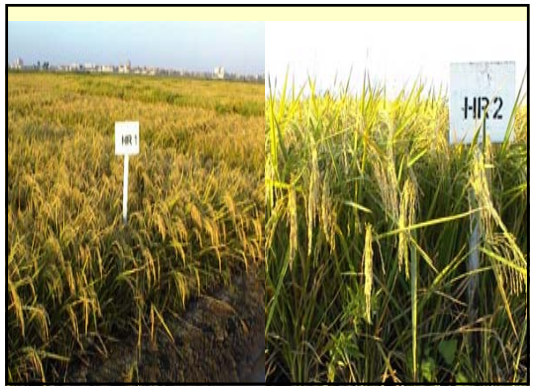
Hybrid Rice purity testing using ISJ9

F1 Individuals — R CMS M



HR purity testing using SSR markers





Optimum package for hybrid rice seed production and CMS multiplication

Operation	Particulars
Sowing date	25 April - 10 May
Seed rate	Seed parent : 27- 36 kg/ha Pollen parent: 9- 12 kg/ha
Nursery	Sparse seeding (42-57 g/m^2) to ensure seedlings with 3-5 tillers in 25 days
Row ratio	8 A line : 2 B line 10A line : 2 R line or 12A line : 2 R line
Number of seeding/hill	1-3 for seed parent 2-3 for pollen parent
Spacing	Male : male 20 cm Male : female 25 cm and 30 cm Female : female 15 cm Plant : plant 15 cm
GA_3 application A local GA3 (BERLEX)	300 g/ha in 500 liters of water at 10% of heading in two split doses of 40% and 60% in an consecutive days
Supplementary pollination	3-4 time a day at peak anthesis time with 30 minutes interval
Roguing	-at vegetative phase based on morphological traits. -At flowering before anthesis. -At maturity based on grain characteristics and seed set rate after removing R line
Seed yield	-A x B : 2.5 – 3.0 t/ha -A x R : 2.0 – 3.8 t/ha

3. Hybrid Rice Cultivation:

Any promising hybrid combination can't exhibited its maximum productivity unless an ideal package of cultivated recommendation will be available.

Operation	Particulars
Seed rate	22 kg/ha
Nursery seeding density	24 g /m 2
Spacing	20 x 20 cm
Seedling/hill	1 – 2
Seedling age	25 – 30 days
Nitrogen application	150 kg / ha in 3 splits
Phosphorus	45 kg /ha
Potash	60 kg / ha
Zinc	30 kg / ha
Plant protection	Need based

Achievements

- Release public bred hybrid SK2034 H (H1).
- Under release SK2046H (H2).
- Promising hybrid entries in the Pipe-line are SK2010H,SK2007H, SK2003 H and SK2074 H
- Promising aromatic hybrids, SK2121H, SK2122H and SK2037H
- New Egyptian CMS and restorer lines developed in the background of elite lines.
- Hybrid seed production package optimized to obtain seed yields of 3.00 t/ha.

Needed for RRTC

- Participate as a promising member in HRDC.
- Testing and evaluation of promising hybrid combinations in Multilocation Yield Trails.
- Exchange genetic materials, such as parental lines, A/B pairs under conversion, designated and released A/B/R/S lines.
- Training human resources.