EFFECT OF SPLIT- APPLIED NITROGEN ON THE PRODUCTIVITY OF TWO RICE HYBRIDS AND SAKHA 104 RICE CULTIVAR

By

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ABSTRACT

Two field experiments were conducted at Etai El- Baroud Agricultural Research Station Farm (Agricultural Research Center) in 2003 and 2004 summer seasons to study the effect of split applied nitrogen on the productivity of two promising rice hybrids and Sakha 104 rice cultivar. One hundred Kg N/ha, as urea form (46%N), was added in three treatments; i.e., 2 doses 2/3 basal in dry soil before flooding and 1/3 7 days before panicle initiation, three equal doses and four equal doses as well as control. Split plot design with three replications, was used (rice cultivars were laid in the main plots, while, nitrogen treatments were laid in the sub-plots). Thirty day old seedlings were transplanted in hills spaced at 20 X 20 cm with 15 m^2 area . All cultural treatments were done as recommended. The main results obtained showed that: -

The hybrid rice cultivars were superior over Sakha 104-rice cultivar in grain yield and its components and all vegetative growth characters except for plant height and number of days to heading. On contrast, Sakha 104 rice cultivar was superior in N% and protein content in rice grain.

Nitrogen application increased vegetative growth characters, grain yield and its components and nitrogen % in both rice grain and straw and grain protein content compared with the control. While, split - applied nitrogen with four equal doses gave a significant effect on vegetative growth characters, and grain yield and its components except for number of panicles / hill, panicle length, number of unfilled grains /panicle, N% and protein content in rice grains, compared with the other nitrogen treatments.

A significant effect, due to the interaction between rice cultivars and split-applied nitrogen on (LAI, CGR, number of

grains / panicle, panicle weight, 1000 - grain weight, grain yield, N uptake by grains and protein content in grain).

INTRODUCTION

Hybrid rice technology has significantly contributed towards food security, environmental protection and employment opportunities in China for the past 25 years. Since the mid- 1990 s, this technology has also been developed and introduced to farmers in India, Vietnam, the Philippines, Bangladesh and United States (Virmani *et al* 2003). Hybrid rice varieties can out yield conventional varieties by 15-20 % under the same in put levels.

Commercial success of hybrid rice technology in China has clearly shown the potential of this technology to meet the ever increasing demands for rice the world over. Efforts to develop and use this technology in Egypt , initiated in 1982 s, have been systematized and intensified since 1995. Within a short span of six years, the hybrids have been released for commercial planting. Many more promising hybrids, with better grain quality and higher level of heterosis are in final stages of evaluation .

No hybrid combination can express its maximum productivity, unless it is grown under ideal package of cultural practices.

From 1995 to 2001 many hybrids showed standard hetrosis ranging from 15-30 %and most of these hybrids have short growth duration Bstawisi et al (2002). Nitrogen fertilization is very important for plant growth, it has be applied at the optimum rate meets the plant need not only the amount of nitrogen added but also the time and methods of application Shiga et al (1977). Nitrogen fertilizer enhance the vegetative growth in all plants specially rice crop and its accumulates in the vegetative parts and later is partially utilized for grain formation Mikkelson (1982). Khaled et al (1999) reported that nitrogen fertilizer increased protein content in rice grain. The increase in nitrogen supply caused increases in rice yield and its components Aidy et al (1988), Abd El -Rahman et al (1990). Also nitrogen has a vital role in nitrogen % in rice grain and nitrogen uptake by rice grain Ebaid *et al* (2000). Rice grain yield was maximum with split nitrogen application Ramasamy *et al* (1985).

To achieve the full grain yield potential of hybrid, an appropriate agronomic package is needed . The high grain yield of

hybrid rice is attributed to high vegetative biomass production, high leaf area and increased number of spikelets and filled grains. To find an optimum agronomic package for hybrids, extensive studies on aspects such as seeding density and nursery management , seedling age and number of seedling $hill^{-1}$, planting geometry , time of planting and nutrient and water managements were carried out at different locations.

This investigation aimed to study the nitrogen efficiency increase through split application on two hybrid rice cultivars as compared to the best local inbred.

MATERIALS AND METHODS

Two field experiments were conducted at the Experimental Farm of Etai El -Baroud Agricultural Research Station (Agricultural Research Center) during 2003 and 2004 summer seasons to investigate the effect of split - applied nitrogen on the productivity of two hybrid rice cultivars SK 2034H (H1) and SK 2035H (H2) compared with the rice cultivar Sakha 104. These two hybrids; namely SK 2034H and SK 2035H; which have already been tested in a hybrid rice yield trial for many years and have given consistently good performance under both normal and saline soil conditions, are being considered for a large scale field level. Split- applied nitrogen as urea form (46% N) with the rate of 100 Kg N /ha was applied as four treatments,; viz., control (T1), two doses (2/3 basal in the dry soil before flooding and 1/3, 7 days before panicle initiation (T2), three equal doses 1/3 basal in dry soil before flooding, 1/3, 20 days after transplanting and 1/3, 45 days after transplanting (T3) and four equal doses 1/4 basal in the dry soil before flooding, 1/4,20 days after transplanting, 1/4, 40 days after transplanting and 1/4, 60 days after transplanting (T4).

A split- plot design, with four replications was used, the main plots were occupied by the three rice cultivars and the sub - plots by the nitrogen treatments. The experimental sites were prepared by two plowing and harrowing then, carefully dry and wet leveled.

Each sub- plot was fertilized with 38 Kg P_2O_5/ha in the form of Super Phosphate (15.5% P_2O_5) added during land preparation. Zinc fertilizer (24Kg Zn SO_4/ha) was mixed with fine soil and manually broadcasted in flooded soil before transplanting. Three to four, thirty day old seedlings were transplanted at 20 cm distance

among hills in rows 20 cm apart. The weeds were chemically controlled using Saturn 50% at 4 L/ha mixed with sand and manually broadcasted five days after transplanting. All cultural practices were done up to harvesting as recommended.

A-Growth characters: -

Seventy days after transplanting, plant samples were randomly collected from each sup plot to determine the following growth characters: -

1- Leaf area index (LAI).

The ratio between the leaf area/ hill divided by ground area (400cm). Leaf area was measured using Leaf Area Meter (Model LI.3000A).

2- Crop growth rate (CGR).

It is defined as the dry matter increase with time (Radford, 1967), using the formula:

$CGR = (W_2-W_1)/(T_2 - T_1)$ g/hill/week.

3- Dry matter production (g / hill). The samples were oven dried at 70 C° for 72 hr or to a constant weight, then, dry matter was recorded.

4- Number of days to heading: - Number of days from sowing to 50% heading was recorded in each sub-plot.

5- Plant height (cm): - Seven days before harvesting plant height of ten random rice plants were measured from soil surface up to the top panicle of the main stem.

B- Grain yield and its components: -

Seven days before harvesting five plants of random hills from each treatment were collected to determine panicle characters (panicle length, number of filled and un filled grains / panicle, sterility %, panicle weight and 1000 - grain weight). An area of 10 m^2 in the center of each sub plot was manually harvested, air dried for about four days, then mechanically threshed. Grain and straw yields were recorded and the grain yield was adjusted to 14 % moisture content and converted into ton/ha .

Harvest index was estimated according to the following equation:-

HI = (Grain yield t/ha/ Biomass yield t/ha) X 100

About 250 g paddy rice and dry rice straw random samples from each sup plot were collected to determine nitrogen content

according to the standard Kjeldahl method while, nitrogen uptak by grains was calculated by multiplying N% by grain yiel Crude protein was calculated by multiplying N% by the factor o 5.95. Data were carried out according to Snedecor and Chochra (1981). LSD test at 5% level of significance was calculated t compare among treatments.

RESULTS AND DISCUSSION

1- Growth characters :-

Effect of nitrogen treatments and two rice hybrids an Sakha 104 cultivar and their interaction on leaf area index (LAI) crop growth rate (CGR), dry matter content (DM), number of da to heading and plant height are presented in Table (1).

Data indicated that (SK 2034) hybrid 1 recorded the highes (LAI), (CGR) and (DM) in 2003 and 2004 followed by (SK2035) hybrid 2 while Sakha 104 rice cultivar recorded the lowest values in these traits.

On contrast, Sakha 104 rice cultivar recorded the highest values in number of days to heading and plant height in 2003 and 2004. These results could be attributed to the strong growth of rice hybrids compared to the inbred. Data also, indicated that nitrogen application significantly increased vegetative growth characters, compared with the control. Furthermore, four equal N doses significantly increased LAI with 7.1and 7.0,CGR with 41.9 and 44.2 g/hill / week, DM with 102.3 and 111.5 g/ hill, plant height and days to heading, over the other nitrogen treatments in 2003 and 2004 respectively. These data are inagreement with those of Ramasamy *et al* (1985) they found that nitrogen application at heading stage significantly increased growth characters. These results could be attributed to the role of nitrogen that applied lately in increasing the efficiency of photosynthesis process and, consequently the metabolites in rice plant.

Table 1: Effect of split- applied N on some growth characters in two hybrids and Sakha 104 rice cultivars in 2003 and 2004 summer seasons .

Main effects	LAI		CGR (g/hill/week)		DM (g/ hill)		No Of days to heading		Plant height (cm)	
	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004
A- Rice Cultivars										
Sk 2034 (H1)	6.8	6.7	38.4	40.2	93.9	92.8	84.9	85.2	91.3	92.0
Sk2035 (H2)	6.1	6.2	34.5	37.2	90.2	88.9	81.6	82.1	90.6	91.2
Sakha 104	5.4	5.3	30.9	32.7	75.8	77.4	93.8	95.2	94.5	95.3
LSD (5%)	0.2	0.3	1.2	1.3	3.2	4.0	2.1	2.2	2.5	2.4
B- N doses										
0	5.0	5.3	21.8	23.1	44.6	50.8	84.0	84.1	87.4	88.1
2 doses	6.1	6.1	38.1	39.0	85.6	90.2	85.0	85.1	90.2	91.5
3 doses	6.0	6.2	38.2	40.0	87.9	92.3	86.3	86.8	91.9	92.4
4 doses	7.1	7.0	41.9	44.2	102.3	111.5	89.6	90.1	97.0	98.2
LSD (5%)	0.7	0.6	2.8	2.5	10.1	11.7	2.6	2.9	3.1	3.3
A X B - F test	*	*	*	*	NS	NS	NS	NS	NS	NS

Data, also, indicated that a significant effect due to the interaction between rice cultivars and spilt- applied nitrogen on LAI and CGR in both seasons. Data in Fig (1) showed that the highest LAI (7.6) value was obtained when hybrid 1 was fertilized with 100 Kg N/ha as four equal doses, while, Sakha 104 rice cultivar recorded the lowest LAI (4.3), when no nitrogen fertilizer was added.

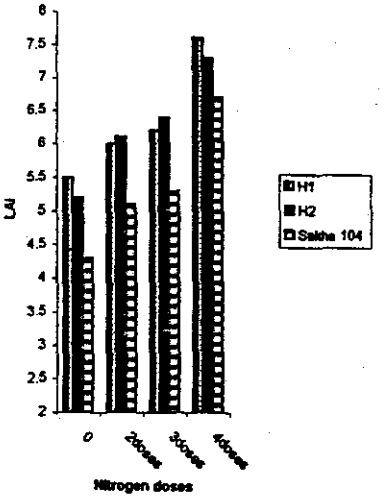
Data in Fig (2) indicated that the highest CGR (44.9 g/hill /week) value was obtained when hybrid 1 (SK 2034) was fertilized with four equal doses of nitrogen followed by hybrid 2 (41.9 g/hill/ week) while, the lowest CGR (19.0 g/hill/week) ,value was obtained when no nitrogen fertilizer was applied to Sakha 104 rice cultivar

11- Number of panicles / hill, panicle length, number of filled and unfilled grains / panicle and sterility %

Number of panicles / hill, panicle length, number of filled and unfilled grains / panicle and sterility % in 2003 and 2004 were presented in Table (2).

Data indicated that no significant differences were observed between H1 and H2 in number of panicles / hill, panicle length and number of filled grains / panicle, while, Sakha 104 rice cultivar

Fig (1) LAI as affected by the interaction between nitrogen doses and rice cultivars.



Fig(2) : CGR as affected by the interaction between nitrogen doses and rice cultivars.

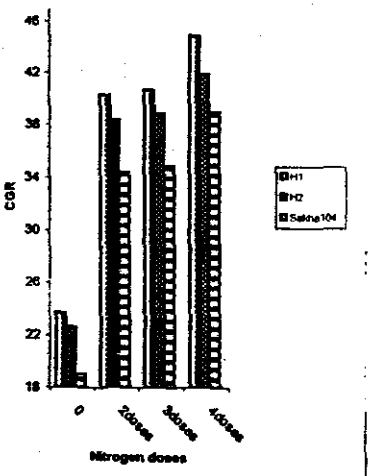


Fig (3) : Number of filling grains/ panicle as affected by the interaction between nitrogen doses and rice cultivars.

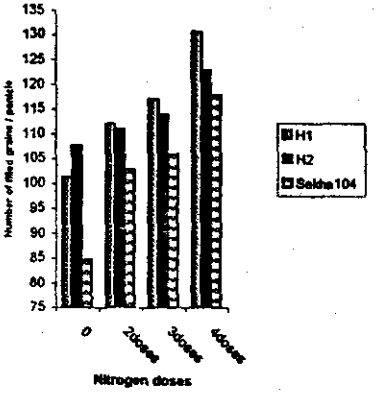
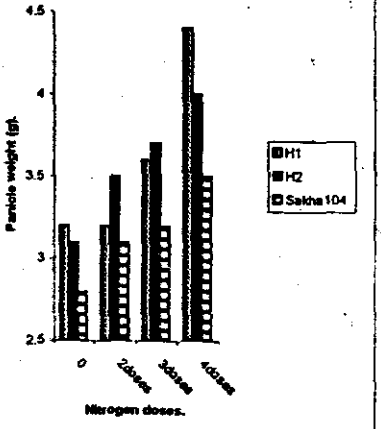


Fig (4): Panicle weight as affected by the interaction between nitrogen doses and rice cultivars.



recorded the lowest values in these traits in 2003 and 2004 seasons. On the other hand H2 recorded the highest number of unfilled grains / panicle in both seasons, while, Sakha 104 rice cultivar recorded the highest sterility %(5.9 and 6.2) in 2003 and 2004, respectively.

Data, also, indicated that all nitrogen treatments significantly increased number of panicles/hill, panicle length, number of filled grains and unfilled grains / panicle and sterility % over the control (no nitrogen added). Data, also, indicated that no significant differences between nitrogen application with three or four doses on number of panicles / hill, panicle length, number of unfilled grains / panicle. Rao and Moorthy (1994) found the same results. Applied nitrogen with four equal doses, significantly increased number of filled grains/ panicle and reduced the sterility % by reducing number of unfilled grains / panicle in both seasons. These data could be attributed to the role of nitrogen fertilizer in late application for increasing the efficiency of metabolic products in the reproductive stage in rice plant.

Table 2: Effect of split applied N on some grain yield components characters in two hybrids and Sakha 104 rice cultivar in 2003 and 2004summer seasons

Main effects	No of panicles /hill		Panicle length (cm)		No of filled grains / panicle		No of un filled grains / panicle		Sterility %	
	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004
A- cultivars										
Sk 2034 (H1)	21.7	21.8	23.3	23.7	116.3	120.0	4.6	4.8	3.7	4.1
Sk2035 (H2)	21.3	21.5	23.4	24.0	114.9	118.4	6.6	6.8	5.3	5.4
Sakha 104	20.0	20.2	21.7	23.0	102.9	107.5	5.5	5.7	5.9	6.2
LSD (5%)	1.2	1.2	1.0	1.0	3.7	4.0	0.8	0.8	0.8	0.9
B-N doses										
0	18.6	19.3	20.3	21.1	97.9	100.2	4.0	4.6	4.6	5.0
2 doses	21.5	21.9	22.3	23.2	110.2	112.7	6.0	6.5	5.0	5.3
3 doses	21.8	22.0	23.7	24.2	112.3	115.3	6.6	7.0	5.7	5.8
4 doses	21.1	21.3	23.7	24.3	123.9	125.7	6.0	6.2	4.7	5.1
LSD (5%)	1.7	1.4	1.2	1.3	5.7	5.9	0.7	0.8	0.7	0.6
A X B F .test	NS	NS	NS	NS	*	*	NS	NS	NS	NS

Concerning the effect of interaction between rice cultivars and nitrogen application data in table (3) showed that a significant effect was observed only on the number of filled grains / panicle in

both seasons, the highest number of filled grains / panicle130.7 was obtained when H1 was fertilized with four equal doses of nitrogen while, the lowest number of filled grains / panicle 84.7 was found when no nitrogen was applied to Sakha 104 rice cultivar. These results could be due to the vital role of nitrogen fertilizer in late booting stage for increasing the physiological processes in rice plant during the reproductive stage of hybrids over the inbred.

111- Panicle weight, 1000 - grain weight, plant biomass, grain yield and harvest index.

Data in Table (3) presented the effect of rice cultivars and split - applied nitrogen and their interaction on panicle weight, 1000-grain weight, plant biomass, grain yield and harvest index in 2003 and 2004 seasons.

Data showed that no significant differences were observed between the two rice hybrids in panicle weight, 1000 - grain weight, plant biomass and harvest index, while, Sakha 104 rice cultivar recorded the lowest values in these traits in both seasons. Concerning grain yield, H1 yielded the highest grain yield (12.8 and 12.7 t/ha) in 2003 and 2004 respectively followed by H2, while, Sakha 104 rice cultivar yielded the lowest grain yield 10.6 and 10.8 t/ha) in 2003 and 2004 respectively. The increase in grain yield in hybrid rice cultivars than Sakha 104 rice cultivar could be attributed to the fact that the two rice hybrids had a high efficiency in growth characters (Table 1).

Table 3: Effect of split - applied N on some grain yield components characters (panicle weight, 1000 - grain weight, and plant biomass and grain yields) in two hybrids and Sakha 104 rice cultivars in 2003 and 2004.

Main effects	Panicle weight (g)		1000 grain weight (g)		Plant biomass (t/ha)		Grain yield (t/ha)		Harvest index	
	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004
A- cultivars										
Sk 2034 (H1)	3.7	3.8	24.2	23.9	25.4	25.8	12.8	12.7	0.46	0.45
Sk2035 (H2)	3.7	3.8	23.6	24.0	25.1	25.3	12.1	12.3	0.43	0.43
Sakha 104	3.2	3.3	23.4	23.6	24.0	23.5	10.6	10.8	0.42	0.40
LSD(5%)	0.1	0.1	0.7	0.6	0.7	0.6	0.3	0.3	0.3	0.3
B- N doses										
0	2.6	2.4	21.9	22.3	21.9	22.8	8.1	8.6	0.41	0.40
2 doses	3.2	3.3	23.0	23.5	25.2	25.4	12.0	12.5	0.42	0.41
3 doses	3.5	3.5	23.8	24.7	26.0	26.2	12.6	12.9	0.43	0.41
4 doses	4.1	4.2	25.5	26.1	27.2	27.8	13.2	13.6	0.43	0.42
LSD (5%)	0.5	0.6	1.3	1.4	1.1	1.2	0.5	0.6	0.03	0.03
A X B - F test	*	*	*	*	NS	NS	*	*	NS	NS

Data, also, showed that the nitrogen treatments significantly increased panicle weight, 1000- grain weight, plant biomass, grain yield and harvest index over the control. While split applied nitrogen, with four equal doses significantly increased panicle weight with 17 and 20%, 1000 - grain weight with 7 and 5%,and plant biomas with 4.6 and 6.1% while, the increase in grain yield was 5.0 and 5.4 % in 2003 and 2004, respectively.

The increase in grain yield when nitrogen fertilizer was applied with four equal doses could be attributed to the increase in grain yield components (panicle weight, number of filled grains / panicle and 1000 - grain weight). These results mean that the role of nitrogen fertilizer applied at heading caused a continuos production of photosynthesis after heading for a large sink size in hybrid rice cultivars than Sakha 104 (Chaudhary *et al* 1994) and (Miah *et al* 1998) reported that the efficiency of hybrid rice cultivars for utilization of fertilizers applied was higher than in inbred. Data in Table (3) also showed that no significant differences were obtained among nitrogen application methods for harvest index in 2003 and 2004.

Concerning the interaction between rice cultivars and split - applied nitrogen, data indicated a significant effect on panicle weight, 1000 grain weight and grain yield. The highest panicle weight (4.4g) was obtained when hybrid 1 was fertilized with 100 Kg N/ha as four equal doses while, the lowest panicle weight (2.8g) was obtained from Sakha 104 with no nitrogen applied.

Figure (5) indicats that the highest 1000- grain weight (26.1g) was recorded when hybrid 1 was fertilized with 100 Kg N/ha as four equal doses. On the other hand, hybrid 2 under no nitrogen applied recorded the lowest 1000-grain weight (21.2g). Fig (6) indicates that the highest grain yield (13.7t/ha) was recorded when hybrid 1 was fertilized by 100 Kg N/ha as four equal doses, while the lowest grain yield (9.0 t/ha) was recorded when no nitrogen was applied.

1V- Nitrogen % and uptake by grain and straw and protein content in rice grain in 2003 and 2004.

Data in Table (4) indicated the effect of split - nitrogen applied in two rice hybrids and Sakha 104 rice cultivar on N% and N uptake in both straw and grain and protein content in 2003 and 2004.

Data in Table (4) indicated that Sakha 104 rice cultivar recorded the highest N % in grain while, no significant difference was recorded between the two rice hybrids in this trait. On the other hand, hybrid 2 recorded the highest N% and N uptake in straw. Data also indicated that hybrid 1 recorded the highest N uptake by grain. This could be due to the highest grain yield in H1 while, no significant difference was observed between hybrid 2 and Sakha 104 in N% in grain.

Concerning protein content in rice grain, Sakha 104 rice cultivar recorded the highest protein content (8.4 and 8.9 %) in 2003 and 2004 respectively while, no significant difference between the two rice hybrids in protein content in grain in both seasons. These results could be due to the high N% in rice grain in this cultivar than the other two rice hybrids.

Fig (5): 1000 grain weight as affected by the interaction between nitrogen doses and rice cultivars.

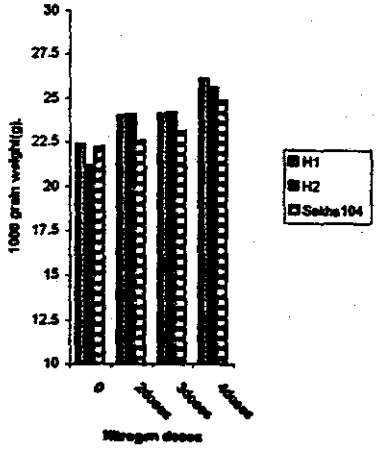
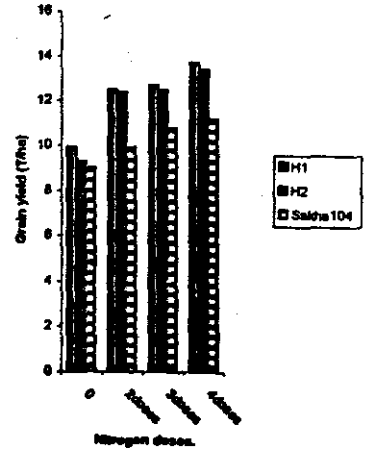


Fig (6); Grain yield (T/ha) as affected by the interaction between nitrogen doses and rice cultivars.



Fig(7):Nitrogen uptake (Kg N/ha) by grain as affected by the interaction between nitrogen doses and rice cultivars.

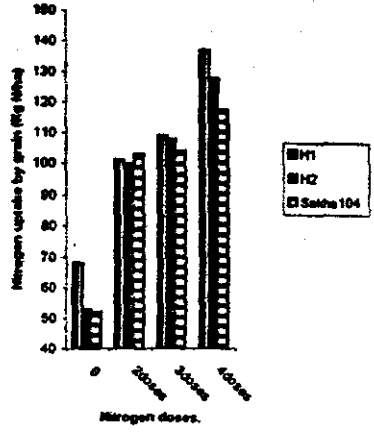


Fig (8): Brotein % in rice grain as affected by the interaction between nitrogen doses and rice cultivars.

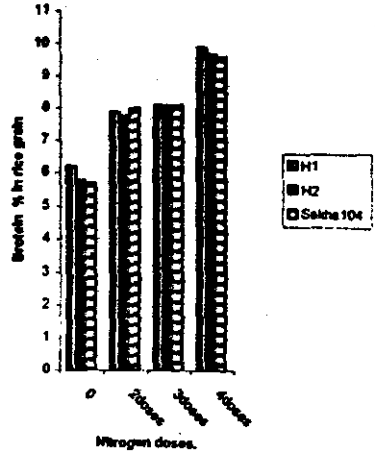


Table 4: Effect of split- applied N on N% and N uptake in both grain and straw and protein content in grain in two rice hybrids and 104 rice cultivars in 2003 and 2004 summer seasons.

Main effects	N% in grain		N% in straw		N uptake by grain (Kg /ha)		N uptake by straw (Kg/ha)		Protein % in grain	
	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004
A- cultivars										
Sk 2034 (H1)	1.26	1.22	0.28	0.27	104.0	101.7	33.4	32.7	7.4	7.3
Sk2035 (H2)	1.23	1.28	0.32	0.33	96.3	97.5	38.5	37.5	7.3	7.6
Sakha 104	1.41	1.50	0.25	0.26	91.2	93.4	32.3	32.0	8.4	8.9
LSD (5%)	0.08	0.07	0.08	0.8	5.7	4.2	1.1	1.0	0.3	0.2
B- N doses										
0	0.88	0.97	0.15	0.18	57.70	62.4	21.0	23.2	5.2	5.8
2 doses	1.40	1.32	0.22	0.25	100.0	101.2	34.0	32.1	8.1	7.6
3 doses	1.48	1.38	0.26	0.31	107.2	105.7	35.3	36.4	8.8	8.2
4 doses	1.58	1.61	0.33	0.37	127.6	125.0	47.8	48.0	9.4	9.6
LSD (5%)	0.5	0.6	0.08	0.07	9.3	10.8	7.5	8.7	0.5	0.7
A X B - F .test	NS	NS	NS	NS	*	*	NS	NS	*	*

Data in Table (4) further indicated that nitrogen application significantly increased N% in both grain and straw, consequently, N uptake in both grain and straw compared with the control in 2003 and 2004. Furthermore, nitrogen application as four equal doses yielded the highest N% and N uptake in both grain and straw and protein content in rice grain in 2003 and 2004 seasons compared with the other nitrogen doses. These results could be attributed to the role of nitrogen in increasing amino acids content and its role as a contributor to the bulk of plant tissues. (Bonner 1969). reported that amino acids content in the plant organs depended on nitrogen levels in plant nutrition, the more nitrogen supply at heading period in rice plant, the more amino acids and protein composed in plant leaves and the longer period the chlorophyll molecules existed. So, the photosynthetic ratios increased and also, the accumulated sugars and in particular sucrose and starch. Consequently, the metabolites synthesized by the rice plant increased. Thompathon and Kelly (1957) clarified that nitrogen was a constituent of amino acids and protein, tended

to encourage the development of vegetative growth of the plant and imported a deep green color of leaves.

Data in Table (4) indicated that a significant effect was recorded due to the interaction between rice cultivars and split - applied nitrogen on N uptake by grain Fig(7) and protein content in rice grain Fig (8). The highest N uptake by grain was obtained when H1 was fertilized with nitrogen as four equal doses while, the lowest N uptake by grain was obtained when no nitrogen fertilizer was applied to Sakha 104 rice cultivar. A similar trend was detected in protein content in rice grain in both seasons.

Generally, it can be stated that hybrid rice cultivars had a high efficiency in the utilization of nitrogen fertilizer than the inbred. Also, split more applied nitrogen as four equal doses, increased grain yield and its components in rice hybrids than two or three doses.

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الملخص العربى

تأثير تجزئة إضافة النيتروجين على إنتاجية صنفين من الأرز الهجين والصنف سخا ١٠٤

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قسم بحوث الأرز– معهد بحوث المحاصيل الحقلية – مركز البحوث الزراعية

أجريت تجربتان حقليتان بمزرعة محطة البحوث الزراعية بايتاي البارود (مركز البحوث الزراعية) خلال الموسمين الزراعيين ٢٠٠٣ و ٢٠٠٤ وذلك لدراسة تأثير

الإضـــافة الجزئية للسماد النيتروجيني على إنتاجية صنفين من الأرز الهجين ٢٠٣٤ و ٢٠٣٥ مقارنـــة بصـــنف الارز سخا١٠٤. أضيف السماد النيتروجيني بمعدل ١٠٠ نيتـــروجين فى صورة يوريا ٤٦ % نيتروجين حيث كانت المعاملة الأولى هى المقارنة حيث لا يضاف تسميد نيتروجيني اما المعاملة الثانية فكانت إضافة السماد النيتروجينى على دفعتين (٣/٢ الكمية على الشراقى قبل الغمر مباشرة ،٣/١ الكمية قبل سبعة ايام من طرد السنابل)اما الدفعة الثالثة فكانت ثلاث جرعات متساوية (٣/١ قبل الغمر مباشـــرة ، ٣/١ بعد ٢٠ من الشتل ،٣/١ بعد ٤٥ يوم من الشتل) وكانت المعاملة الاخـــيرة عبارة عن أربع جرعات متساوية (٤/١ قبل الغمر مباشرة،٤/١ بعد ٢٠ يـــوم مـــن الشتل ، ٤/١ بعد ٦٠ يوم من الشتل). أجريت جميع العمليات الزراعية الباقـــية حسب التوصيات. إستخدم تصميم القطع المنشقة مرة واحدة حيث وضعت الأصناف فى القطع الرئيسية بينما وضعت المعاملات السمادية فى القطع المنشقة.

بعـــد ٧٥ يـــوم مـــن الشتل أخذت عينات خضرية من كل المعاملات وذلك لتقدير الصـــفات الخضـــرية (دليل مساحة الأوراق،معدل النمو،مقدار المادة الجافة / نبات وتاريخ التزهير /صنف) . قبل الحصاد بعشرة ايام أخذت اطوال النباتات كما تم اخذ عشـــر سنابل من كل معاملة لتقدير صفات السنبلة .تم حصاد ١٠م٢ من كل معاملة يـــدويا وتركت للجفاف هوائيا لمد ثلاثة أيام ثم تم تقدير صفات المحصول على حسب نســـبة الرطوبة بالحبوب ١٤% كما أخذت من كل معاملة عينات من كل من القش والحبوب لتقدير نسبة كلا من النيتروجين فى الحبوب والقش والبروتين فى الحبوب فقط وقد أوضحت النتائج المتحصل عليها على ما يلى :-

تفـــوق صـــنفي الأرز الهجـــين على الصنف سخا ١٠٤ فى كلا الموسمين فىصفات المحصـــول ومكوناته وفى جميع الصفات الخضرية ما عدا صفتى تاريخ التزهير و طول النـــبات. أما بالنسبة لنسبة النيتروجين فى القش والحبوب ونسبة البروتين فى الحبوب فقد تفوق الصنف سخا ١٠٤ على صنفى الأرز الهجين فى كلا الموسمين.

وقـــد أوضحت معاملة إضافة النيتروجين على أربع دفعات متساوية تفوقا كبيرا على باقـــى المعـــاملات فى الصـــفات الخضرية وصفة نسبة كلا من النيتروجين فى القش والحبوب وكذلك نسبة البروتين فى الحبوب وكذلك صفة المحصول ومكوناته ما عدا صـــفات (عدد السنابل / جوره ،طول السنبلة وعدد الحبوب الفارغة / سنبلة) فلم تكن هناك اى فروق معنوية بين إضافة النيتروجين على أربع دفعات او ثلاث دفعات على هذه الصفات الثلاث.

كما أوضحت النتائج أن هناك تأثيرا معنويا للتفاعل الداخلى بين الأصناف والإضافة الجزئية للنيتروجين فى كلا الموسمين على الصفات (دليل مساحة الأوراق، معدل نمو المحصـــول،عدد الحبوب / السنبلة، وزن ١٠٠٠ حبة، محصول الحبوب طن / هكتار، نسبة النيتروجين المأخوذ بالحبوب وكذلك نسبة البروتين فى الحبوب.

ويمكن استنتاج من هذا البحث ما يلى :-

ا- صنفي الأرز الهجين اكثر تفوقا على صنف الأرز سخا ١٠٤ فى الصفات الخضرية وصـــفات المحصـــول ومكوناته إلا أن سخا ١٠٤ كان أعلى فى نسبة النيتروجين فى الحبوب وبالتالى نسبة البروتين فى الحبوب.

ب- إضـــافة السماد النيتروجينى على أربع دفعات متساوية افضل من الإضافة على دفعتين او ثلاث دفعات متساوية وخاصة فى صنفى الأرز الهجين وقد يرجع ذلك الى الكفـــاءة العالية لأصناف الأرز الهجين فى الاستفادة المستمره من السماد النيتروجينى من بداية حياة النبات حتى مرحلة مابعد طرد السنابل.