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Response of Egyptian Hybrid Rice One Cultivar to Times of Nitrogen Application and Foliar Spraying of Ascobien Compound .

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ABSTRACT

Two field experiments were conducted at the Experimental Farm of Rice Research and Training Center (RRTC),Sakha, Kafr el-sheikh, Egypt during 2014 and 2015 seasons. The objective of this investigation was aimed to study the response of Egyptian hybrid rice one cultivar (SK 2034 H) to times of nitrogen fertilization and foliar spraying of ascobien compound. The nitrogen times of fertilization included four treatments i.e. Basal soil (B), Mid tillering (MT), panicle initiation (PI) and booting stage (BT). Foliar application of ascorbien compound at rate of 1.050 Kg/fed at two dates as follows, without ascorbien, spraying after transplanting by 25 days and at 25 and 45 days from transplanting. The main finding could be summarized as follows,1- Nitrogen fertilization splitting at rate of (69 Kg N/fed) at 17.25 Kg N/fed at B+ MT+ PI+ BT significantly maximize leaf area index, number of tillers /hill, number of filled grain/hill, 1000 grain weight and grain yield/fed, hulling, milling and broken rice percentage. 2- Foliar spraying of ascorbien compound twice at 25 and 45 days from transplanting significantly increased the previous studied traits as we mentioned before. 3- The interaction between times of nitrogen fertilization and foliar spraying of ascorbien compound significantly affected all the studied characters in this study. It could be concluded that splitting nitrogen at four equal doses (17.25 Kg N/fed) and foliar spraying of ascorbien compound at 25 and 45 days from transplanting of Egyptian hybrid rice one cultivar (SK 2034 H) was the recommended treatment to improve growth, yield components and grain quality and produced the greatest grain yield (4.48 t/fed) under the environment condition of Sakha Kafr El-sheikh.

Keywords: Hybrid rice, time of nitrogen application and foliar application of ascobien.

INTRODUCTION

Rice (*Oryza sativa* L.) is one of the most important cereal crops of the world, grown in wide range of climatic zones, to nourish the mankind. It is the staple food for more than three billion people that is over half of the world's contributes over 20% of the cereal consumption (FAO, 2004). Increasing productivity per unit land area is a native goal to meet the consistent demands from this crop. Rice occupies a conspicuous position in the predominately agricultural economy of Egypt, this attention is required to improve its yield and quality characters. The yearly cultivated area by rice in Egypt is almost more than one fifth of the total area. The total cultivated area of rice in Egypt was about 0.6 million per hectare, which produced about 7.24 million tons of paddy rice with an average of 9.56 t/ha (R.R.T.C. 2012) .

Hybrid rice is producing from a cross between two genetically distinct rice parents, so when the right parents are selected, the hybrid will have both greater vigor and yield than either of the parents (Xie *et al*., 2007). Therefore, hybrid rice is one way to improve rice grain yield by exploiting the heterosis in the F_1 hybrid, which hybrid rice can be increase the yield by about 20% higher than inbred rice cultivars (Abo Youssef *et al*., 2005). Hybrid rice proved more remunerative than high yielding commercial varieties . the yield advantage of hybrid rice is about (15-20%) higher than that of the best high-yielding commercial varieties. Grain yield is a function of the number of panicles, grains/panicle and grain weight. Hybrid rice has bigger panicles and more spikelets/panicle but, less filled grain percentage probably due to higher nutrient demand during reproductive growth stage and hybrid rice requires different strategies for N management to maximize expression of their yield advantage (Virmani, 1996). Growth and development processes associated with higher grain yield of rice hybrids include a more vigorous and extensive root system (Li, 1981; Yang and Sun 1988), increased growth rate during vegetative growth (Yamauchi, 1994), more efficient sink formation and greater sink size (Kabaki, 1993), greater carbohydrate translocation from vegetative plant parts to the spikelets (Song *et al*., 1990), and larger leaf area index during the grain filling period

Nitrogen is an essential rice plant nutrientbeing a component of amino acid, nucleic acid, nucleotides, chlorophyll, enzymes and hormones, which led to promote rapid rice growth and improve grain yield and its quality through higher tillering, leaf area development, grain formation, grain filling and protein synthesis. Interestingly, potassium is linked with all phenomena of plant photosynthesis, respiration, metabolism of fats, carbohydrates and nitrogenous compounds, enzyme activation, cell elongation and water efficiency, so, it is considered the key element in hybrid rice nutrition for improving root growth and plant vigor , helping prevent lodging and enhancing rice resistance to pests and diseases (Krishnakumar *et al*., 2005).The nitrogen deficiency in the Egyptian soils is one of major limiting factor for rice production then nitrogen is essential to the rice plant, with about 75% of leaf N associated with chloroplasts, which are physiologically important in dry matter production through photosynthesis (Dalling, 1985). Rice plants require N during the vegetative stage to promote growth and tillering, which determines the potential number of panicles (Mae, 1997).

Timing of fertilizer application may be the most critical factor in determining fertilizer uptake efficiency and crop yield. This is especially true for nitrogen fertilizer when fertilizer is applied near the time of physiological plant demand, therefore; the plant is able to be more efficiency uses the nutrients. The more nutrients that are used, the less opportunity there will be for loss. So that, it should have to manage the nitrogen fertilizer schedules to best match application with the plant demands. Split application of nitrogen as compared to single application can reduce potential nitrogen losses by up to 30% and reduce potential groundwater contamination. In order to obtain the maximum effect of nitrogen fertilizer it is not only important to resort correct dose of the fertilizer but also to apply it in appropriate time (Thakur, 1993).

Ascobien contains 13% citric acid, 25% ascorbic acid plus 62% organic materials. Ascorbic acid has effects on many physiological processes including the regulation of growth and metabolism of plants (Foyer, 1993). Ascorbic acid is small, water-soluble molecule, which acts as a primary substrate in the cycling pathway for detoxification and neutralization of superoxide radicals and singlet oxygen, ascorbic acid is a key substance in the network of plant antioxidants, including glutathione and enzymatic antioxidants that detoxify H_2O_2 to counteract oxygen radicals produced by the Mehler reaction and photorespiration (Noctor and Foyer, 1998 and Smirnoff, 1996). These free radicals may cause oxidative stress resulting in cellular damage by oxidation of lipids, proteins and nucleic acids so, ascorbic acid protect metabolic processes, Noctor and Foyer (1998). Ascorbic foliar application increased the yield of rice crop, Taha (2008) and Gharib *et al*., (2011).Therefor The present study was designed to determine the optimum time application of nitrogen splitting and foliar spraying with ascobien compound on growth, yield characters and quality of Egyptian hybrid one rice cultivar .

MATERIALS AND METHODS

Two field experiments were conducted at the Experimental Farm of Rice Research and Training Center (RRTC), Sakha, Kafr El-Sheikh, Egypt during 2014 and 2015 rice seasons. The main objective of this investigation was aimed to identify the optimum application time of nitrogen fertilizer and foliar spraying of ascobien compound and its effect on growth characters, yield, its components and quality of Egyptian hybrid one rice cultivar (SK 2034 H). The previous crop was barley during the both seasons of the study. Representative soil samples were taken from each site at the depth of 0-30 cm from the soil surface. Samples were air-dried then ground to pass through a two mm sieve and well mixed. The procedure of soil analysis followed the methods described by (Black *et al*., 1965). Some chemical and physical properties of the soil in the experimental site are presented in Table 1.

The experimental design:

The experimental design was split-plot design with four replications. The main plots were assigned to time of nitrogen application, while Times of foliar ascbien compound applications were arranged in the sub - plots as follows:

1-Nitrogen applications (main plots):

Nitrogen fertilizer in the form of urea 46% at the rate of 69 kg N/fed was distributed at different growth stage of rice as follows in Table (2)

Table (1):Soil physical and chemical properties of the experimental site before planting in 2014 and 2015 summer seasons.

Soil properties	2014	2015
Mechanical:		
Clay %	55.9	56.0
Silt %	31.5	32.0
Sand %	12.6	12.0
Texture	Clayey	Clayey
Chemical:		
Organic Matter (O.M)%	1.45	1.50
pH(1:2.5 soil suspension)	8.35	8.44
Ec (ds.m^{-1})	3.12	3.34
Total N (ppm)	477.00	430.50
Available P (ppm)	14.00	12.00
Available K (ppm)	460	432
Available ammonium (ppm)	18.0	17.2
Nitrate concentration (ppm)	14.0	13.2
Soluble anions, meq.L^{-1} :		
CO^{--}_3	--	--
HCO^-_3	5.30	6.20
Cl^-	8.50	9.10
SO^{--}_4	17.40	18.00
Soluble Cations, meq.L^{-1} :		
Ca^{++}	11.70	10.70
Mg^{++}	3.50	5.00
Na^{++}	1.60	2.00
K^+	14.40	15.60
Availabe micronutrients (ppm)		
Fe^{++}	5.00	5.80
Mn^{++}	3.04	3.20
Zn^{++}	1.00	0.95

Table (2) : The splitting of nitrogen application at different growth stages.

Nitrogen application (splitting)	kg N/ fed				
	Basal soil	Mid- tillering	Panicle initiation	Booting stage	Total
1/2 B + 1/2 MT	34.5	34.5	-	-	69
2/3 B + 1/3 MT	46	23	-	-	69
1/3 B +1/3 MT+1/3 PI	23	23	23	-	69
1/4B+1/4MT+1/4PI+1/4BT	17.25	17.25	17.25	17.25	69

B= Basal soil, MT= Mid-tillering, PI= Panicle initiation and BT= Booting stage

2-Ascobien compound as foliar application (sub- plots).

The ascobein compound (25% ascorbic acid, 13% citric acid plus 62% organic materials) used in this study were produced by the General Organization for Agricultural Equalization Fund, Ministry of Agriculture and Land Reclamation, Egypt (Abou El-Naga, 1993), foliar applications of ascobein compound were at the rate of 2.5 kg/ha (equal the concentration of 1g Ascobien/liter of water) the treatments of ascobein compound were as follows: without ascobien foliar application (control), application once at 25 days after transplanting, and twice at 25 and 45 days after transplanting.

Nursery treatments and preparation:

The nursery area was well ploughed and leveled then, Phosphorus (15.5% P_2O_5),potassium sulphate (48% K_2O) were applied before land preparation and zinc sulphate (Zn SO_4) was applied after wet leveling (buddling) as well as all other culture practices were applied as recommended to the nursery. The seeds of rice, at the rate of 10 kg fed^{-1}, were soaked in fresh water for 24 hours and incubated for another 48 hours to hasten early germination. Pre-germinated seeds were uniformly broadcasted in all nurseries on May 15th in 2014 and 2015 seasons.

The permanent field

The experimental sites were prepared by twice plowing and harrowing then, the well dry leveling was done and light wet leveling was carefully made. Each plot was fertilized by 15.5 kg P_2O_5 fed^{-1} in the form of calcium super phosphate (15.5% P_2O_5) during soil preparation. Potassium fertilizer was added as form of potassium sulphate, at the rate of 24 kg K_2O fed^{-1}, as basal application and incorporate into dry soil. One inorganic nitrogen source (urea 46% N) was applied according to the experimental treatments as we mentioned before in Table (2) . Thirty days old seedling were pulled and transferred to the permanent field then, transplanted regularly in the plots at 20 cm distances between hills and rows (25 hills m^{-2}). About of 2–3 seedlings $hill^{-1}$ in all experiments were transplanted in both studied seasons. The plot size was 16 m^2 (4 × 4). Weeds were chemically controlled using Saturn 50% at the rate of 2 L/ fed. It was mixed with enough sand to make it easy for homogenous distribution. It was applied seven days after sowing in the nursery and four days after transplanting into 3 cm water depth and kept without either flushing or irrigation until all the water in the field reach to the saturation to increase the efficiency of the herbicide to control weeds. The other usual cultural practices were conducted in growing rice fields as the recommendation of Rice Research and Training Center (R.R.T.C., 2010).

Studied characters:

A. Growth characters:

1. leaf area index (LAI): Leaf area (blade area) was measured by portable leaf area meter (Model LI-3000A). LAI at 60 days after transplanting (DAT) was calculated by using the following formula:

$$LAI = \frac{\text{Leaf area of fixed number of hills}}{\text{Ground area occupied by these hills}}$$

2. -Number of tillers/hill: Ten hills were randomly selected in the central of each plot . The number of tillers was counted and the average number of tillers /hillwas computed at 60 days after transplanting.

B-Yield and its attributes:

1- Number of panicles/hill: Number of panicles at harvest was counted in five hills, and then the average number per $hill^{-1}$ was computed.

2-Number of filled grains per panicle: Number of filled grains per panicle was counted from the 10 selected panicles from each plot, and then the average number per panicle was computed.

3- Thousand grain weight (g): Thousands of rough grains were counted from each sub plot after harvesting and weighted .

4- grain yield (t /fed): Rice plants were harvested when the moisture content of the grains was about 18-20%. Guarded ten square meters from the center of each plot were manually harvested, then gathered in bundles and left in the field for three days to dry. The air-dried bundles were weighted and the total weight of both grain and straw were recorded. The air dried bundles were mechanically threshed and grains weight per 10 m^2 was recorded. The moisture content was estimated using portable moisture meter. The weight of grains was adjusted to 14% moisture content. The weight of grain yield were transformed as tons per feddan.

C-Grain quality characters:

Hulling percentage, milling output and head rice percentage were estimated according to the methods reported by Adair (1952).

1-Hulling percentage:-About 150g cleaned rough rice samples at moisture content 12 – 14% were estimated using experimental huller machine.

$$\text{Hulling (\%)} = \frac{\text{Brown rice Wt.}}{\text{Rough rice Wt.}} \times 100$$

2- Milling percentage:-Brown rice was consequently milled using MC Gill Miller no.2. The sample was milled for 60 sec. The milled rice sample was then collected and the weight was taken and percentage of total milled rice was computed.

$$\text{Milling (\%)} = \frac{\text{Milled rice Wt.}}{\text{Rough rice Wt.}} \times 100$$

3- Broken rice percentage:-Whole grains were separated from the total milled rice using a rice sizing device. The separation of these particles is termed as grading. However, the broken are fragments of grains, the lengths of which are less than $^3/_4$ of the whole grains after separated into two different sizes .The amount of broken rice yield is then obtained and calculated.

$$\text{Broken rice (\%)} = \frac{\text{Broken rice Wt.}}{\text{Milled rice Wt.}} \times 100$$

Statistical analysis:

The obtained data were subjected to analyses of variance according to Gomez and Gomez (1984). Treatment means were compared by Duncan's Multiple Range Test (Duncan, 1955). All statistical analysis was performed using "MSTATC" computer software package according to (Russell,1986).

RESULTS AND DISCUSSION

1-Growth characters:

Results represented in Tables (3 and 4) clearly showed that leaf area index at 60 days after transplanting (DAT) and number of tillers/hill of Egyptian hybrid rice one cultivar as influenced by time of nitrogen fertilizer splitting and foliar spraying of ascobien compound and their interaction during 2014 and 2015 rice seasons revealed that leaf area index and number of tillers/hill were gradually increased by increasing nitrogen fertilizer splits . Applying nitrogen in to four equal doses were produced higher values of leaf area index and more number of tillers/hill followed by the three splits than the other N splits in the two seasons. These findings might be due to the continous supply of nitrogen to meet critical growth stages, especially tillering stage, which improved vegetative growth and increased tillering capacity and also, nitrogen supply had a controlling influence on leaf area index, primarily through its effect on tillers number and thus leaf production and expansion as a result to increase number of cell division and elongation . These results in good accordance with those reported by Stevens *et al*. (2001) Balasubramanian (2002) and Edwin *et al*. (2004).

Foliar application of ascobein significantly increased leaf area index and number of tillers/hill compared with control treatment (without ascobein) in both seasons Table (3). The highest values were found when ascobein was sprayed two times in 2014 season, while in 2015 season, spraying ascobien one time gave nearly the same value of LAI as spraying two times. These findings indicate that spraying ascobien compound twice has a significant effect in improving vegetative growth and increasing tillering capacity, particularly with rice hybrids it might be due to the organic materials in ascobien which supply the plant by nitrogen and other nutrients resulted in increase in plant growth beside the ascorbic and citric acid as antioxidant that minimized the free radicles . These results are in agreement with those obtained by Taha (2008) who found that foliar spraying with ascobein at the beginning of rice tillering stage resulted in a significant increase in leaf area index and number of tillers of rice compared with the control treatment. Similar findings by Abd El-Hameed et al. (2004) and Okasha (2015) .

Table (3) : Means of leaf area index and number of tillers /hill of Egyptian hybrid rice one cv. as affected by different time of nitrogen and foliar spray of ascobien during 2014 and 2015 seasons.

Treatments	Leaf area index		Number of tillers/hill	
	2014	2015	2014	2015
Nitrogen splitting (N) :				
1/2 B + 1/2 MT	4.45 d	4.70 c	18.57 d	19.79 d
2/3 B + 1/3 MT	4.72 c	5.07 b	20.55 c	21.62 c
1/3 B +1/3 MT+1/3 PI	5.19 b	5.39 a	23.50 b	24.33 b
1/4B+1/4MT+1/4PI+1/4BT	5.60 a	5.49 a	28.42 a	29.23 a
F-test	**	*	**	**
Ascobien spraying (A)				
Without ascobien application	4.79 b	4.95 b	16.59 c	17.96 c
Spraying once at 25 days	4.97 b	5.23 a	23.77 b	24.72 b
Spraying twice at 25 and 45days	5.21 a	5.31 a	27.91 a	28.56 a
F-test	**	**	**	**
Interaction F-test N x A	**	N.S.	**	**

B= Basal soil, MT= Mid-tillering, PI= Panicle initiation and BT= Booting stage

***, ** and NS indicate $p< 0.05$, $p<0.01$ and not significant, respectively. Means of each factor designated by the same letter are not significantly different at 5% level using Duncan's multiple range test.**

The combination of nitrogen splits into four equal doses with ascobien as foliar two times resulted increase in LAI and number of tillers/hill compared with the other combinations in a both seasons except the LAI in the second season which had no significant differences (Table 4). It can be easily observed that, spraying ascobien two times (25 and 45 DAT) with any of nitrogen splits treatments surpassed the spraying only one time (25 DAT) in both LAI and number of tillers in the two studied seasons. The lowest values of LAL and number of tillers/hill were produced by two equal doses of nitrogen without spraying ascobien (control) in the two seasons. These results in good agreement with those reported by Gharieb (2015) and Gomaa (2015).

Table (4): means of leaf area index and number of tillers/hill of Egyptian hybrid rice one cv. as affected by the interaction between time of nitrogen application and foliar spray of ascobien during 2014 and 2015 seasons.

Nitrogen splitting (N) :	Ascobien spraying	Leaf area index	Number of tillers/hill	
		2014	2014	2015
	Control (without)	4.360 f	11.67 h	13.36 i
1/2 B + 1/2 MT	Once (25)	4.440 f	19.54 f	20.73 f
	Twice (25+45)	4.550 ef	24.50 d	25.29 d
	Control (without)	4.580 ef	14.80 g	16.21 h
2/3 B + 1/3 MT	Once (25)	4.740 de	21.72 e	22.73 e
	Twice (25+45)	4.850 d	25.13 d	25.92 d
	Control (without)	4.920 d	18.37 f	19.47 g
1/3 B +1/3 MT+1/3 PI	Once (25)	5.210 c	24.36 d	25.17 d
	Twice (25+45)	5.430 bc	27 76 c	28.36 c
	Control (without)	5.290 bc	21.52 e	22.81 e
1/4B+1/4MT+1/4PI+1/4BT	Once (25)	5.500 b	29.47 b	30.25 b
	Twice (25+45)	5.020 a	34.25 a	34.65 a

B= Basal soil, MT= Mid-tillering, PI= Panicle initiation and BT= Booting stage

Means of each column designated by the same letter are not significantly different at 5% level using Duncan's multiple range test.

2-Yield and yield attributes :

results related to number of panicles per hill, number of filled grains per panicle, 1000-grain weight and grain yield t/ha of hybrid one rice cultivar as influenced by time of nitrogen splitting and foliar spraying with ascobien compound as well as their interactions during 2014 and 2015 seasons are presented in Tables (5,6 and 7).

Increasing number of of nitrogen- splits up to four times caused a significant increase in number of panicles per hill, number of filled grains per panicle, 1000-grain weight and grain yield t/ha Table (5). The highest values of this traits were obtained by the application of nitrogen in four equal doses, while, the lowest values were obtained by adding nitrogen fertilizer either into two equal doses or two third as basal and one third at MT in both seasons. Increasing nitrogen splits increased number of panicles/ hill, number of filled grains /panicle and 1000-grain weight through increasing number of tillers/ hill and this variation could mainly be due to partitioning the amount of nitrogen through several doses during vegetative period. Thus, the latest application delayed leaf senescence and promoted grain filling. Moreover, the important effect of delayed application of nitrogen to improve the viability of flag leaf with second and third leaves which supply the plant by about 75 % of the photosynthetic products specially during filling period. The increase in grain yield with splitting nitrogen fertilizer may be due to the considerable increase in early growth which reflected in higher grain yield attributes (number of panicle/ hill, panicle weight, number of filled grains/ panicle and 1000-grain weight) and in turn increased grain yield . A positive association between nitrogen fertilizer and grain yield and its attributes has been reported by Edwin *et al*., (2004), Mohamed (2006), Mikhael (2007) and Raj *et al*., (2014).Also, Uddin et al. (2013) who concluded that increment in grain yield could be attributed to the role of nitrogen in increasing photosynthetic efficiency as well as translocation of assimilates, which reflected the increase in most of grain yield components.

The results in Table (5) indicated that foliar spraying of ascobien compound as foliar spray either one time or two times gradually increase grain yield and its attributes. Rice plants sprayed with ascobien compound twice recorded the highest values of grain yield and all the previous traits compared with the control and other treatments in both seasons, respectively. This might be due to the considerable increase in early growth which reflected in higher grain yield attributes (number of panicle/ hill, number of filled grains/ panicle and 1000-grain weight) and in turn increased grain yield. A positive association between foliar application of ascobien and grain yield has been reported by Taha (2008), Gharib *et al*. (2011) and Gomaa (2015).

Table (5): Means of number of panicles/hill , number of filled grains/panicle, 1000-grain weight (g) and grain yield (t/fed) of Egyptian hybrid rice one cv. as affected by different time of nitrogen application and foliar spray of ascobien during 2014 and 2015 seasons.

Treatments	Panicles (No./hill)		Filled grain (No./panicle)		1000-grain weight (g)		Grain yield (t/fed)	
	2014	2015	2014	2015	2014	2015	2014	2015
Nitrogen splitting (N)								
1/2 B + 1/2 MT	14.37c	15.78c	50.47c	54.13c	24.22c	24.10c	3.87 d	3.95 d
2/3 B + 1/3 MT	15.00c	16.24c	50.86c	54.38c	24.24c	24.14c	3.94 c	4.02 c
1/3 B +1/3 MT+1/3 PI	18.04b	19.47b	58.58b	60.81b	24.64b	24.54b	4.08 b	4.15 b
1/4B+1/4MT+1/4PI+1/4BT	21.13a	22.36a	69.44a	70.70a	24.99a	25.13a	4.24a	4.29 a
F-test	**	**	**	**	**	**	**	**
Ascobien spraying (A)								
Control (without)	12.79c	14.07c	48.64c	51.08c	24.12c	23.85c	3.83 c	3.88 c
Once (25)	17.69b	18.54b	65.19b	59.60b	24.55b	24.44b	4.03 b	4.12 b
Twice (25+45)	20.93a	22.78a	67.19a	70.34a	24.90a	25.14a	4.23 a	4.31 a
F-test	**	**	**	**	**	**	**	**
Interaction F.test N x A	**	**	*	**	*	**	**	**

B= Basal soil, MT= Mid-tillering, PI= Panicle initiation and BT= Booting stage
*** and ** indicate p< 0.05, p<0.01 and not significant, respectively. Means of each factor designated by the same letter are not significantly different at 5% level using Duncan's multiple range test.**

All the interactions had a significant effect on number of panicles per hill, number of filled grains/panicle, 1000-grain weight and grain yield in both seasons (Tables 6 and 7).

Table (6) : Means of number of panicles / hill and number of filled grains/ panicle of Egyptian hybrid rice one cv. as affected by the interaction between different times of nitrogen application and foliar spray of ascobien during 2014 and 2015 seasons.

Nitrogen splitting(N)	Ascobein spraying	Panicles (No./hill)		Number of filled grains/panicle	
		2014	2015	2014	2015
	Control(without)	10.59 g	11.95 g	46.32 g	49.85 g
1/2 B + 1/2 MT	Once (25)	14.59 e	15.53 f	56.09 f	59.77 f
	Twice(25+45)	17.93 c	19.87 d	67.00 d	71.10 d
	Control(without)	10.93 g	12.12 g	47.36 g	49.77 g
2/3 B + 1/3 MT	Once (25)	15.66 d	16.42 e	56.53 f	59.73 f
	Twice (25+45)	18.40 c	20.17 d	67.70 d	71.64 d
	Control(without)	13.59 f	14.99 f	56.67 f	58.63 f
1/3 B +1/3 MT+1/3 PI	Once (25)	18.93 c	19.88 d	62.39 e	64.44 e
	Twice (25+45)	21.59 b	23.33 b	74.67 b	77.37 b
	Control(without)	16.04 d	17.23 e	69.19 c	70.07 d
1/4B+1/4MT+1/4PI+1/4BT	Once (25)	21.57 b	22.32 c	73.74 b	74.78 c
	Twice (25+45)	25.79 a	27.52 a	83.39 a	85.26 a

B= Basal soil, MT= Mid-tillering, PI= Panicle initiation and BT= Booting stage
Means of each column designated by the same letter are not significantly different at 5% level using Duncan's multiple range test

Table (7) : Means of weight of 1000-grain (g) and grain yield (t/ fed) of Egyptian hybrid rice one cv. as affected by the interaction between different times of nitrogen application and foliar spray of ascobien during 2014 and 2015 seasons.

Nitrogen splitting (N)	Ascobein spraying	1000-grain weight (g) 2014	1000-grain weight (g) 2015	Grain yield (t/fed) 2014	Grain yield (t/fed) 2015
	Control(without)	23.83 e	23.45 h	3.66 k	3.77 h
1/2 B + 1/2 MT	Once (25)	24.33 d	24.18 fg	3.88 i	3.94 g
	Twice (25+45)	24.50 c	24.66 cd	4.06 f	4.14 e
	Control(without)	23.84 e	23.56 h	3.69 j	3.75 i
2/3 B + 1/3 MT	Once (25)	24.24 d	24.10 g	3.95 g	4.06 f
	Twice (25+45)	24.63 c	24.76 c	4.16 d	4.27 c
	Control(without)	24.30 d	24.07 g	3.91 h	3.93 g
1/3 B +1/3 MT+1/3 PI	Once (25)	24.61 c	24.50 de	4.08 e	4.18 d
	Twice (25+45)	25.02 b	25.06 b	4.27 b	4.33 b
	Control(without)	24.53 c	24.32 ef	4.05 f	4.07 f
1/4B+1/4MT+1/4PI+1/4BT	Once (25)	25.02 b	24.99 b	4.22 c	4.31 b
	Twice (25+45)	25.43 a	26.08 a	4.44 a	4.48 a

B= Basal soil, MT= Mid-tillering, PI= Panicle initiation and BT= Booting stage
Means of each column designated by the same letter are not significantly different at 5% level using Duncan's multiple range test.

Results presented in Tables (6 and 7) show that the highest values of grain yield and its attributes were recorded with adding nitrogen fertilizer in four equal doses (B+MT+PI+BT) with spraying ascobien twice in the two seasons. Spraying ascobien under any of the nitrogen splits caused a significantly increase in all the previous characters as we mentioned. On the other hand, the lowest values of the studied traits were recorded with adding nitrogen fertilizer in two equal doses (1/2B+1/2MT) without spraying ascobien (control) in the two seasons, respectively. Therefore, the increase in grain yield due to interaction between applying nitrogen and spraying ascobien was the logical resultant due to the achieving increased in its components, i.e. number of panicles/ m^{-2} and number of grain/ panicle. Similar trend was found by Metwally et al. (2011b).

3-Grain quality characters:

Percentages of hulling, milling and broken rice as affected by the different splits of nitrogen and foliar spraying with ascobien, as well as, their interaction in the two seasons are presented in Tables (8 and 9).

The different time of nitrogen application had a positive significant effect on hulling, milling and broken rice percentage in both studied seasons Table (8). The four nitrogen splits showed significant differences on SK.2034H during both seasons, The highest percentages of hulling and milling reached to the maximum values when nitrogen fertilizer was applied in four equal splits without beg differences with the three splits, while the broken rice % perform the opposite trend and reached to the highest values when nitrogen was applied as two splits (2/3 basal + 1/3 at mid tillering stage), whereas, the lowest percentages of hulling and milling were obtained by adding nitrogen fertilizer into both two equal splits either (1/2 basal + 1/2 at mid tillering) or (2/3 basal + 1/3 at mid tillering stage) in the two studied seasons. It can be easily noticed that the lowest broken rice percentage was observed when nitrogen fertilizer was applied either as four equal splits or three splits. It could be attributed to the increase of photosynthesis due to the continuous supply of nitrogen consequently increase the filling processes resulted in increase starch endosperm and minimize the hull weight and thickness, while the broken rice increase when the continuous supply of nitrogen decline under the application of nitrogen as two splits due to the reducing in photosynthetic products and minimizing the filling rate and percentage .These findings are in close agreement with those reported by Metwally et al. (2011a).

Table (8): Percentages of hulling, milling and broken rice of Egyptian hybrid rice one cv. as affected by time of nitrogen and foliar application of ascobien during 2014 and 2015 seasons.

Treatments	Hulling (%) 2014	Hulling (%) 2015	Milling (%) 2014	Milling (%) 2015	Broken rice(%) 2014	Broken rice(%) 2015
Nitrogen splitting(N)						
1/2 B + 1/2 MT	80.48d	78.11c	69.59d	69.45d	26.42a	26.10a
2/3 B + 1/3 MT	81.06c	78.43b	71.45c	69.80c	24.19b	25.45b
1/3 B +1/3 MT+1/3 PI	81.63b	78.66ab	72.81b	70.14b	23.58b	24.72c
1/4B+1/4MT+1/4PI+1/4BT	82.34a	78.87a	74.71a	70.51a	23.58b	23.88d
F-test	**	*	**	**	**	**
Ascobein spraying (A)						
Control	80.55c	78.39 b	69.26b	69.82b	25.30a	25.83a
Once	81.37b	78.52ab	69.93b	69.98ab	24.34b	25.09b
Twice	82.22a	78.64a	71.23a	70.12 a	23.68c	24.20c
F-test	**	*	**	**	**	**
Interaction F.test NxA	**	**	**	*	**	**

B= Basal soil, MT= Mid-tillering, PI= Panicle initiation and BT= Booting stage
***and ** indicate p< 0.05, p<0.01 and not significant, respectively. Means of each factor designated by the same letter are not significantly different at 5% level using Duncan's multiple range test.**

Percentages of hulling, milling and broken rice were significantly affected by ascobien as foliar application in the two studied seasons Table (8). The highest values of hulling, milling and lowest broken rice percentage were obtained by implementation of spray ascobien two times in both seasons. While, the lowest values of hulling, milling and highest broken rice percentages were recorded when ascobien was not applied. Similar results were obtained by Taha (2008).

Results presented in Table (9) indicated that there were a significant effect on hulling, milling and broken rice percentage in the two seasons due to the interaction effect between the splitting time of nitrogen and foliar spraying with ascobien. The highest values of hulling, milling and lowest broken rice percentages were obtained when ascobien was applied at two times with the application of nitrogen fertilizer in four equal doses one at each of basal soil, mid-tillering, panicle initiation and booting stage in both studied seasons. Whereas, the lowest values of hulling, milling and highest broken rice percentages were detected when adding of nitrogen fertilizer in two equal doses without spraying ascobien (control) in the two seasons of the study. Similar trend was obtained by Metwally *et al.* (2011a).

Table (9): Percentages of hulling, milling and broken rice of Egyptian hybrid rice one cv. as affected by the interaction between time of nitrogen and foliar application of ascobien during 2014 and 2015 seasons.

Nitrogen splitting(N)	Ascobein spray	Hulling (%)		Milling (%)		Broken rice (%)	
		2014	2015	2014	2015	2014	2015
1/2 B + 1/2 MT	Control(without)	79.46 g	77.90 f	68.61 h	69.27 i	27.87 a	26.88 a
	Once (25)	80.51 ef	78.16 ef	69.78 g	69.49 h	26.63 b	26.46 a
	Twice (25+45)	81.46 cd	78.28 de	70.38 fg	69.58 gh	24.77 d	24.96bcd
2/3 B + 1/3 MT	Control(without)	80.06 f	78.31 de	70.66 fg	69.65 gh	25.50 c	26.53 a
	Once (25)	81.11 de	78.44cde	70.94 f	69.78 fg	23.75 ef	25.33 bc
	Twice (25+45)	82.02 bc	78.53bcd	72.74 de	69.96 ef	23.48 ef	24.50 de
1/3 B +1/3MT+ 1/3 PI	Control(without)	81.02 de	78.57bcd	72.27 e	69.99 e	23.98 ef	25.37 b
	Once (25)	81.52 cd	78.66 bc	72.34 e	70.12 de	23.49 ef	24.77 cd
	Twice (25+45)	82.35 b	78.76abc	73.81 bc	70.30 cd	23.28 ef	24.03 ef
1/4 B+1/4 MT+ 1/4 PI+1/4 BT	Control(without)	81.66 cd	78.78 ab	73.49 cd	70.38 bc	24.01 e	24.52 de
	Once (25)	82.34 b	78.84 ab	74.64 b	70.52 ab	23.50 ef	23.81 fg
	Twice (25+45)	83.03 a	79.00 a	76.00 a	70.65 a	23.22 f	23.31 g

B= Basal soil, MT= Mid-tillering, PI= Panicle initiation and BT= Booting stage
Means of each column designated by the same letter are not significantly different at 5% level using Duncan's multiple range test.

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استجابة صنف الارز الهجين مصري ١ لمواعيد اضافة النيتروجين والرش الورقي بمركب الاسكوبين

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أجريت تجربتان حقليتان في المزرعة البحثية بمركز البحوث والتدريب فى الارز بسخا كفرالشيخ – مصر خلال الموسمين ٢٠١٤ و ٢٠١٥ بهدف دراسة استجابة صنف الأرز الهجين مصري ١ (سخا ٢٠٣٤) لكل من مواعيد اضافة النيتروجين والرش الورقي بمركب الاسكوبين علي النمو والمحصول. تم استخدام التصميم الاحصائي الفطع المنشقة مرة واحدة في الموسمين واحتلت الفطع الرئيسية مواعيد اضافة النيتروجين (يوريا) بينما كان في القطع المنشقة الرش الورقي بمركب الاسكوبين. ويمكن عرض اهم النتائج كما يلي : ١- اوضحت النتائج ان تجزئة السماد النيتروجيني علي اربع جرعات متساوية (١٧.٢٥ كجم لكل فدان) هي اضافته قبل الوراعة خلطا بالتربة الجافة وعند مرحلة التفريع المتوسط وعند بداية تكوين السنبلة وعند مرحلة الحبلان ادت الي زياده معنوية في صفات دليل مساحة الاوراق وعدد الفروع بالجورة وعدد السنابل بالجورة ومتوسط عدد الحبوب الممتلئة بالسنبلة ووزن الالف حبة ومحصول الحبوب للفدان ونسبة التبييض والتقشير والحبوب المكسورة. ٢- اشادت النتائج الي ان الرش الورقي للاسكوبين مرتين الاولي بعد ٢٥ والثانية بعد ٤٥ يوم من الشتل ادت لزيادة معنوية في الصفات المدروسة والتي تم ذكرها سابقا.٣- التفاعل بين مواعيد اضافة النيتروحين والرش الورقي بمركب الاسكوبين كان له تاثيرا معنويا علي كل الصفات التي تم دراستها. ويمكن التوصية باضافة النيتروجين علي اربعة مراحل متساوية (١٧.٢٥كجم نيتروجين للفدان) بالاضافة لرش موكب الاسكوبين مرتين بعد ٢٥ يوم و٤٥ يوم من الشتل حيث ان هذه المعاملة كانت افضل معاملة حيث انها ادت الي تحسين النمو الخضري بالاضافة الي زيادة مكونات المحصول وصفات الجودة للحبوب وانها اعطت اعلي محصول حبوب (٤.٤٨ طن للفدان) لصنف الارز الهجين مصري واحد (سخا ٢٠٣٤) تحت طروف الدراسة في سخا كفر الشيخ.