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Double purpose (Forage and seed) of mungbean(*Vignaradiata* L. Wilczeck) as affected by urea foliar application in sandy soil.

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ABSTRACT

Two field experiments were implemented during summer of 2014 and 2015 seasons at researches and production station of National Research Centre Al Emam Malek village, Al Nubaria district, Al Behaira Governorate, Egypt. The aim of study was to determine effect of urea foliar application at 35- 42- 49 DAS on forage yield and its protein also, at 35- 42- 49 DAS from cut on seed yield and its components of two varieties local kawmy-1 and king introduced from Australia. King variety produced higher forage yield, no. of leaves/plant and higher plants than kawmy-1 but lower protein in forage. Due to seed yield king produced higher no. of pods/plant, seed, straw and biological yields/hectare but kawmy-1 recorded the higher harvest index. Foliar application of 1% urea at 35 DAS produced the highest no. of leaves/plant but at 49 DAS gave the tallest plants. Foliar 1% urea at 35 days after cut produced the highest no. of pods/plant, seed, straw and biological yields/fed. but foliar 1% urea at 42 DAC recorded the highest harvest index. Interaction of king and 1%urea foliar application at 35 DAS gave the highest no. of leaves/plant and at 35 DAC had superiority in no. of pods/plant also, seed, straw and biological yields/ fed. but king x 49 DAS gave the tallest plants but kawmy-1 x foliar urea 1% at 42 DAC recorded the highest harvest index.

Keywords: Mungbean – urea –forage – foliar application

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INTRODUCTION

Mungbean (*Vigna radiata* L. Wilczek) is a summer legume crop with short duration (70-90 days) and had high nutritive value. Its seed contain protein ranged from 22 – 28%, 60-65% carbohydrates, 1-1.5% fat, 3.5-4.5% fibers and 4.5-5.5% ash. It has many effective uses, green pods in cooking as peas, sprout rich in vitamins and amino acids. It can produce a large amount of biomass and recover after grazing to yield abundant seeds. It can be used in intercropping system with maize Abd El-lateef 1993, Hirota *et al*., 1995 and Faruque *et al*., 2000, with sorghum Ashour *et al*., 1991, and between young trees for four years prior to canopy closure Milnond *et al*., 1999 also, it can be good forage Boe*et al*., 1991, Elkramany 2006 and as non-traditional broilers feed-stuff El-khimsawy *et al*., 1998.

There was sharp shortage in summer forage in Egypt. Although winter forage ranged from 1.18-1.32 million ha/year. Mungbean mostly grown for seed production but it has potential as a dual-purpose crop (early season forage production followed by seed production). Double use (forage+seed) of mungbean can be low input technology and low cost alternative to summer forage in Egypt Elkaramany *et al*., 2005 and Elkaramany 2006. Many researchers revealed the superiority of king and kawmy-1 varieties under Egyptian conditions Elkramany 2001, Elkramany *et al*., 2001, Zeidan *et al*., 2001, Amany 2002 ,Elkramany *et al*., 2003, 2005 and Elkramany 2006. Foliar application of urea improved mungbean in the most growth and yield characters RaziehKhalilzadeh, 2012. Bradl, 2004 and Pradeep and Elamathi, 2007 stated that mungbean growth mostly affected by poor management and soil fertility so, foliar feeding with urea is often the most effective and economical way to improve plant nutrient deficiency. Stancheva, 2004 concluded that higher values of biomass especially of leaves and roots at budding and flowering stages are observed in the variants with foliar feeding, Zeidan and Nofal 2002 , Nijjar 1985 reported near conclusions.

Thus the aim of this work was to study the effect of foliar application of 1% urea at different times on two varieties of mungbean to produce double products (forage+seed) under poor sandy soil condition.

MATERIALS AND METHODS

Two field experiments were carried out during summer season of 2014 and 2015 in Research and Production Station, National Research Centre, Al Emam Malek Village, Al Nubaria District, Al Behaira Governorate, Egypt.

Location and climate of experimental site: this experimental farm (latitude 30˚30'1.4''N, and longitude 30˚19'10.9''E, and mean altitude 21 m above sea level). The data of temperature and relative humidity were obtained from "Local Weather Station inside Researches and Production Station of National Research Centre (NRC). Temperature averages (^{o}c) during trial period were May (25.0) – June (25.5) – July (25.6) – August (26.2). Humidity average (%) were May (67.0) – June (75.8) – July (76.0) – August (76.5) respectively.

The experimental soil was analyzed according to the method described by Chapman and Pratt (1978) and results are presented in table 1.

Table (1): Mechanical and chemical analysis of experimental soil

Sand %	Silt %	Clay %	pH	Organic matter, %	CaCO3 %	E.C. dS/m	Soluble N, ppm	Available P, ppm	Exchangeable K, ppm
91.2	3.7	5.1	7.3	0.3	1.4	0.3	8.1	3.2	20

The field ploughed twice and ridged. The plot included 5 rows 10 meter long and 0.5 m apart with total area 25 m^2. Hill spacing was 20 cm within the row. After inoculated seeds with specific strain 2-4 seeds in each hill were put and covered with thin layer of soil. Seeds were sown in 8 and 11 May in both seasons. Irrigation took place immediately after sowing according to sprinkler system. Fertilizers added to soil in the form of farmyard manure at the rate of 10 m^3/fed. (Feddan = fed. = 4200 m^2) before sowing and NPK at the rate of 30 kg N/fed. as ammonium nitrate 33% N, 31 kg P_2O_5/fed. as calcium superphosphate 15.5% P_2O_5 and 10 kg/fed. K_2O as potassium sulfate 48% K_2O. The experimental design was complete randomized block design in four replicates.

Treatments were:

1- Varieties (Kawmy-1 and King)

2- Urea foliar application at the rate of 1% (control – 35 – 42 – 49 days after sowing and after cut DAS).

Kawmy-1 is local variety and king is Australian imported variety, source of both varieties was Field Crops Research Department, National Research Centre, Egypt.
Urea foliar treatments were done twice 35, 42 and 49 days after sowing and after cutting.

At 60 DAS forage cutby hand cutting at 5 to 10 cm above soil level and sample of $1m^2$ from centre of each plot taken, dried for determine protein% in dry forage, whole forage of each plot weighted for forage yield per feddan and the following characters measured 1- Forage yield (ton/feddan) 2- Protein % in forage 3- Plant height (cm) 4- Number of leaves/plant then plants take to grow for seed production, harvest date at 130 days from sowing and the following characters were measured:-

1- Number of pods/plant 2- Seed yield (kg/fed.) 3- Straw yield (kg/fed.) 4- Biological yield (kg/fed.) 5- Harvest index %.

Combined analysis of the two seasons was done and the obtained data were statistically analyzed according to Snedecor and Cochran (1990), treatments means were compared using least significant differences LSD at probability level of 5 %.

RESULTS AND DISCUSSION

Data presented in table 2 show significant differences between two varieties in all studied characters.

Table (2) Varietal differences between Kawmy-1 and King in forageyield and yield components (combined of 2014 and 2015 seasons).

Characters / varieties	Forage Yield (ton/fed.)	Protein % In forage	Plant Height (cm)	No. of Leaves /plant
Kawmy-1	5.48	15.6	73.0	12.4
King	6.83	15.2	81.0	15.0
LSD (0.05)	0.22	n.s	2.48	1.84

It is clear from data in table 2 that King variety surpassed Kawmy-1 in all studied characters with significant differences except for protein % in forage kawmy-1 recorded insignificant increase. King variety recorded 24% increase in forage yield, 11% in plant height and 21% in no. of leaves than kawmy-1.

Data presented in table 3 show significant differences between two varieties in all studied characters.King variety surpassed Kawmy-1 in yield and its components but kawmy-1 recorded higher harvest index than king.King variety produced 11% increase in seed yield/feddan; 26% in straw yield/fed.and 24% in biological yield/feddan and 32% in no. of pods/plant but Kawmy-1 surpassed King by 12% in harvest index. Superiority of King variety under Egyptian condition reported by many researchers El-kramany*et al*., 2001, 2003.

Table (3) Varietal differences between Kawmy-1 and King in yield and yield components (combined of 2014 and 2015 seasons).

Characters / varieties	No. of pods /plant	Seed Yield (Kg/fed.)	Straw Yield (Kg/fed.)	Bio-Yield (Kg/fed.)	Harvest Index %
Kawmy-1	27.5	634	1.9	2.5	25.4
King	36.5	705	2.4	3.1	22.7
LSD (0.05)	2.60	4.88	0.12	0.24	1.84

Table 4 show significant differences between dates of urea foliar application in studied characters except for protein% in forage. Foliar application of 1% urea at 35 or 42 or 49 DAS increased all studied characters compared to control. Treatment of urea foliar application at 35 DAS had superiority on other treatments; it recorded increase by 44% in forage yield, 19% in plant height, 94% in no. of leaves/plant and 5% in protein% in forage compared to control.It can be concluded that these increase may be due to effect of urea as highly soluble in water and can be readily absorbed through the leaves especially under trial condition which irrigate by sprinkler system in poor sandy soil.

Table (4) Effect of urea foliar application on forage yield and yield components (combined of 2014 and 2015 seasons).

Characters / Date of urea application	Forage Yield (Ton/fed.)	Protein % In forage	Plant Height (cm)	No. of Leaves /plant
control	4.98	15.0	65.5	8.6
35 DAS	7.18	15.8	78.5	16.7
42 DAS	5.83	15.6	81.5	15.0
49 DAS	5.73	15.2	83.5	14.5
LSD(0.05)	0.22	n.s	1.22	0.66

Data in table 5 show the differences between treatments of urea foliar application at 35, 42 and 49 days after cut DAC which clear that there were significant differences between treatments in seed yield and all yield components. Urea foliar application at 35 DAC had superiority on all treatments except for harvest index, values of treatment 35 DAC surpassed control by 324% in no. of pods/plant; 180% in seed yield/feddan; 189% in straw yield; 187% in biological yield but 3% less than control in harvest index.

Table (5) Effect of urea foliar application on yield and yield components (combined of 2014 and 2015 seasons).

Characters / Dates of urea application	No. of pods /plant	Seed Yield (Kg/fed.)	Straw Yield (Kg/fed.)	Bio-Yield (Kg/fed.)	Harvest Index %
control	14.0	426	1336	1762	23.8
35 DAC	45.4	766	2534	3300	23.3
42 DAC	43.0	753	2283	3036	24.8
49 DAC	35.8	733	2290	3023	24.2
LSD(0.05)	1.42	1.44	12.4	8.44	0.22

It can be concluded that these increase may be due to effect of urea as highly soluble in water and can be readily absorbed through the leaves as well as its important role as a carrier for many nutrients and could probably explain its enhancing effect on the uptake of most nutrients via leaves. RaziehKhalilzadeh, 2012. Bradl, 2004 and Pradeep and Elamathi, 2007 reported same result on mungbeanalso, Zeidan and Nofal2002 ,Nijjar 1985 reported near conclusions.

Values in table 6 show significant differences between interactions in forage yield/feddan, plant height and no. of leaves/plant but insignificant in protein% in forage. There was constant trend due interaction of king variety and urea foliar application at 35 DAS it had superiority in the two characters and produced 7.40 ton/feddan in forage yield and 18 leaves/plant. Interaction of king variety and application of 1% urea at 49 DAS produced the tallest plants but kawmy 1 and urea application at 35 DAS produced forage contain the highest protein % (16.1). Results trend of interaction is logic due to superiority of king variety and urea application at 35 DAS thus, it can be concluded that response of the two varieties is same for different dates of urea foliar application.

Table (6) Interaction of varieties and urea foliar application on forage yield and its components (combined of 2014 and 2015 seasons).

Varieties	Dates of urea application	Forage Yield (ton/fed.)	Protein % In forage	Plant Height (cm)	No. of Leaves /plant
Kawmy 1	control	4.62	14.90	62.00	8.6
	35 DAS	6.20	16.10	75.00	16.7
	42 DAS	5.60	15.80	78.00	15.0
	49 DAS	5.50	15.60	79.00	14.5
king	control	5.92	14.50	69.00	9.4
	35 DAS	7.40	15.50	82.00	18.0
	42 DAS	7.10	15.40	85.00	16.5
	49 DAS	6.90	15.40	88.00	16.0
LSD(0.05)		0.22	n.s	1.48	1.02

Data presented in table 7 clear that there were significant differences between interactions in seed yield and yield components. Interaction of king variety and foliar application of 1% urea at 35 DAC recorded superiority in seed yield and all yield components except for harvest index kawmy-1 and 42 DAC recorded the best result. The trend was in accordance with those obtained in forage yield and its components which were logic due to superiority of king variety and urea application at 35 DAS thus, superiority of these interaction may be due to fast grow of king variety after cut and produce more leaves and can be readily absorbed urea in age of 35 DAC through the leaves as well as urea important role as a carrier for many nutrients and could probably explain its enhancing effect on the uptake of most nutrients via leaves.

Table (7) Interaction of varieties and urea foliar application on yield and yield components (combined of 2014 and 2015 seasons).

Varieties	Dates of urea application	No. of pods /plant	Seed Yield (Kg/fed.)	Straw Yield (Kg/fed.)	Bio-Yield (Kg/fed.)	Harvest Index %
Kawmy 1	control	15.8	410	1214	1624	25.20
	35 DAC	44.4	720	2240	2960	24.30
	42 DAC	42.0	710	1942	2652	26.70
	49 DAC	28.2	695	1951	2646	26.30
king	control	22.0	442	1458	1900	22.30
	35 DAC	46.4	812	2828	3640	23.30
	42 DAC	44.2	796	2624	3420	23.30
	49 DAC	43.4	770	2630	3400	22.60
LSD(0.05)		0.60	4.20	12.84	8.84	0.20

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