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Effect of Nitrogen Fertilization on Growth and Yield of Purple Passionfruit Plant under the Egyptian Conditions.

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STUDIES WERE carried out for two successive seasons (2006 and 2007) to evaluate the effect of different doses of nitrogen fertilization (0,200,300,400,500g/plant vine) on growth and yield of purple passionfruit.

Results revealed that, the high rates of nitrogen fertilization 400g/plant were more effective on increasing vine length, leaf area, number of leaves and number of branches / plant than the low rat and the control. Generally low rate of nitrogen fertilization (200,300g / plant) did not show any significant effect on stem diameter and root length / plant than the control in the first season. The dry weight of leaf, vine, root g / plant and fruit weight g / plant was clearly significantlly increased at the hight level of nitrogen fertilization (400 and 500g / plant) than the control in the first season. Contrary the number of fruits / plant had taken opposite trend except level 500g in the second season.

Generally the effect of nitrogen 500g level in the second season was less than the two low rates of nitrogen on growth , Nitrogen rate less than 400g / plant was too low to production significant growth and yield.

Conclusion recommendation for nitrogen fertilization on purple passionfruit under the Egyptian conditions is the rate of nitrogen fertilization 400g / plant.

Keywords : Passionfruit, Nitrogen fertilization, Yield, Growth.

The purple passionfruit (passiflora edulis) is the largest genus of the family passifloraceae. It is a vine of potential importance as vitamin source of ascorbic acid (V.C) and caroteniods (V.A). The fruit can be eaten out of the hand , or processed into fruit juice , sherbet and jam for local and export markets . It has become a popular addition to some dies in United state (Arjona *et al.*, 1991) .

The yield of passsionfruit is influenced by several production factors, among them, the climate, the soil and the manuring, irrigation practices and pollination (Saleh and Zarad, 1996). Nitrogen (N) is the most absorbed nutrient by the passionfruit plant (Analucia Borges *et al.*, 2006) and the most critical aspects of optimizing crop growth is plant nutrition.

The fertilizer recommendations for purple passionfruit based on investigations conducted elsewhere vary widely. Nakasone and Paull (1999) recommended N 294 kg ha^{-1} sourced from NPK 10-5- 15 fertilizer.

Menzel *et al.* (1993) recommended N 280 kg ha^{-1} sourced from alternate applications of NPK 15- 4 -11 fertilizer .

Nitrogen is vital for vigorus growth and flowering of passionfruit (Menzel *et al.* (1991). Passion vines are heavy feeders but over fertilization will damage the roots, and possibly destroy the plant (Knight and Julian, 2005).

This study focused on the nitrogen requirement of the vegetative growth and the yield of passionfruit in Egypt.

Material and Methods

Experiments were conducted on purple passionfruit (Passiflora edulis), growing in private farm at El Mansouria district Giza Governorate during two successive seasons (2006 and 2007) in order to study the effect of nitrogen requirement fertilization on vegetative growth and yield of purple passionfruit. Vines were about 3 years old at the start of the experiment. Analysis on the investigated soil was carried out according to Wild and Vigot (1985) and the data are shown in Table 1. The vines were 3×3 meter apart and trained on trellises were allowed to grow from each plant and side shoots were removed until the vines reach the wire 2m apart. Sixty vines were selected and divided into five groups each group contains twelve vines which represent treatment (12 replicates for each vine) . six vines for the growth and yield determination and the other six vines left for the root determination (three vines for the first season and the others in the second seasons. In early spring (March) before growth begins (Knight and Julian, 2005), vines long in the two seasons were 270,300cm respectively, five nitrogen fertilizer doses (0,200,300,400,500 gm / plant were added to the plants respectively (sources of N. was ammonium sulphate 20.5 N). Every month after N application at the period from April to August the following studied were recorded. Vine length (cm), leaves area (cm2 / plant), number of leaves / plant, and number of branches / plant. At harvest date 80- 85 days after pollination according to Casimir *et al.* (1981), stem diameter mm/ plant root length cm / plant , (leaf , vine, root d.wt g / plant). Fruit weight (g), No. of fruits / vine and the yield / vine (kg) were recorded . Data were analyzed by significant differences ($p \leq 0.5$) between the treatments were determined by Waller and Duncan's (1969).

TABLE 1. A- Physical analysis of the soil

Depth cm	Coarse sand %	Fine sand %	Silt %	Clay %	$CaCo_3$ %	Texture
0-30	36.28	8.50	14.89	36.59	3.43	Sandy clay
30-60	32.81	6.50	18.49	38.30	3.75	Clay loam
60-90	18.28	11.81	27.61	38.42	3.68	Clay loam

B - Chemical analysis of the soil

Depth (cm)	EC mmhos cm/ 25 °C	PH	Cations							Anions				
			Meq. / 100g. soil			mg / 100gm. soil				Meq. /100gm.soil			ppm /100 gm.soil	
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	Zn	Mn	Fe	Hco_3	Cl^{-}	So_4^{+}	NH_4	No_3+No_2
0-30	0.36	7.20	0.64	0.30	0.41	0.40	0.81	1.55	0.80	0.90	0.22	0.66	4.00	0.66
30-60	0.41	7.40	0.58	0.41	0.96	0.07	0.77	1.16	1.39	0.90	0.20	0.99	5.06	0.51
60-90	0.49	7.50	0.37	0.39	1.55	0.02	0.50	1.25	0.88	0.95	0.12	1.05	5.45	0.69

Results and Discussion

Data in Fig. (1&2) shows the results of vine growth of purple passionfruit in response to nitrogen (N) fertilization , during five months after application . Low doses (200,300 gm N / plant) generally increased the vine length and leaf area than the control. There were no significant differences between the two doses in every month after application. N fertilizer (400, 500 gm / plant) was more effective in increasing vine length and leaf area than the control and the low doses ,that is true in the first season of investigation except that the high level N (500 gm / plant) in the second year was less than N level (200.300 and 400) . These results are agree with those obtained by Gilmore (1983), Sale (1988), Menzel *et al.* (1991), and Aiyelaagbe *et al.* (2005) who mentioned that nitrogen is vital for vigorous growth of passionfruit . N rates less than 90 kg ha^{-1} were generally too low to produce significant growth increases compared with no N application. Sub optimal N may stunt the growth. Similarly, excessive application of N may stimulate vegetative growth.

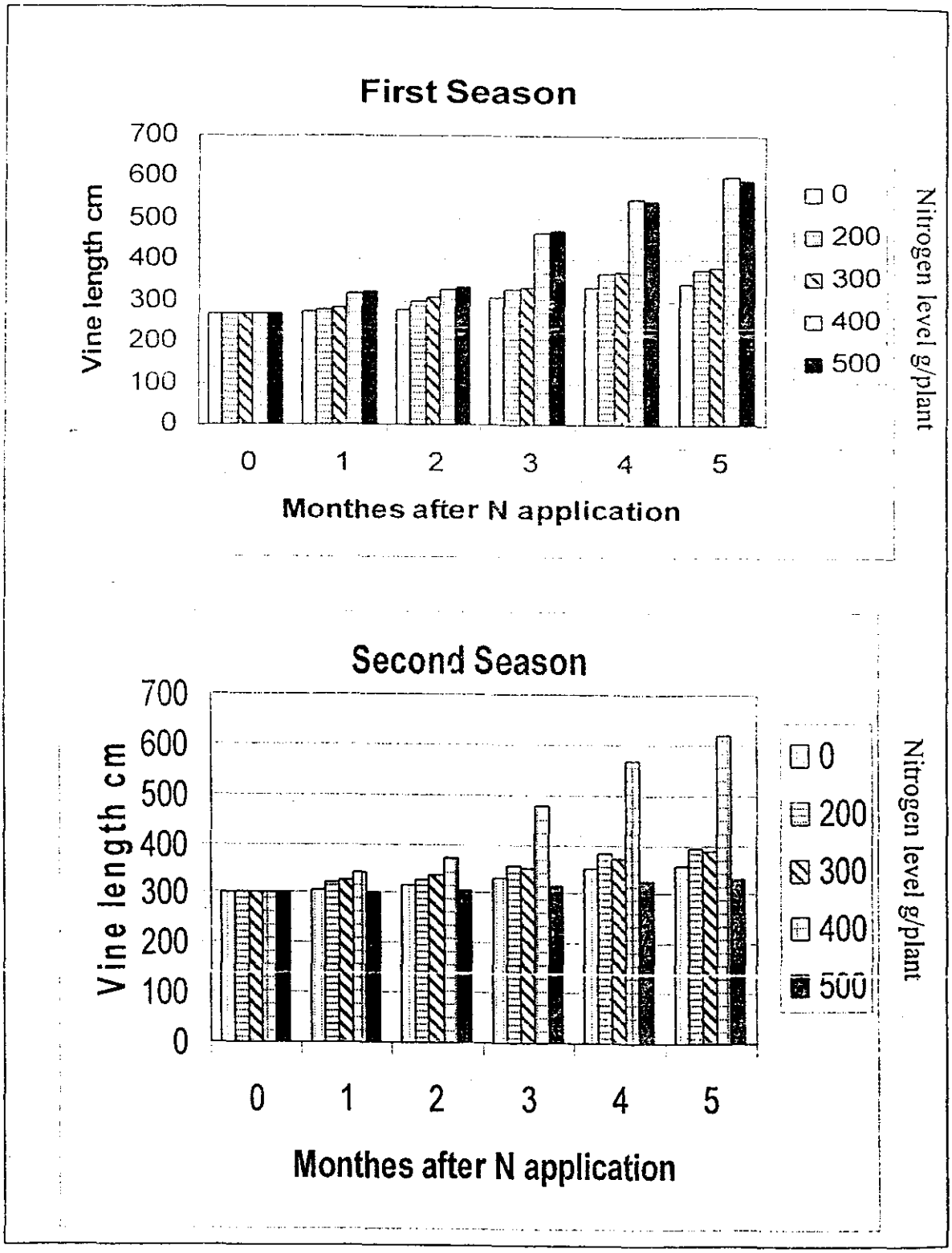

Fig. 1. Effect of different nitrogen fertilization rates on Vine length of purple passionfruit .

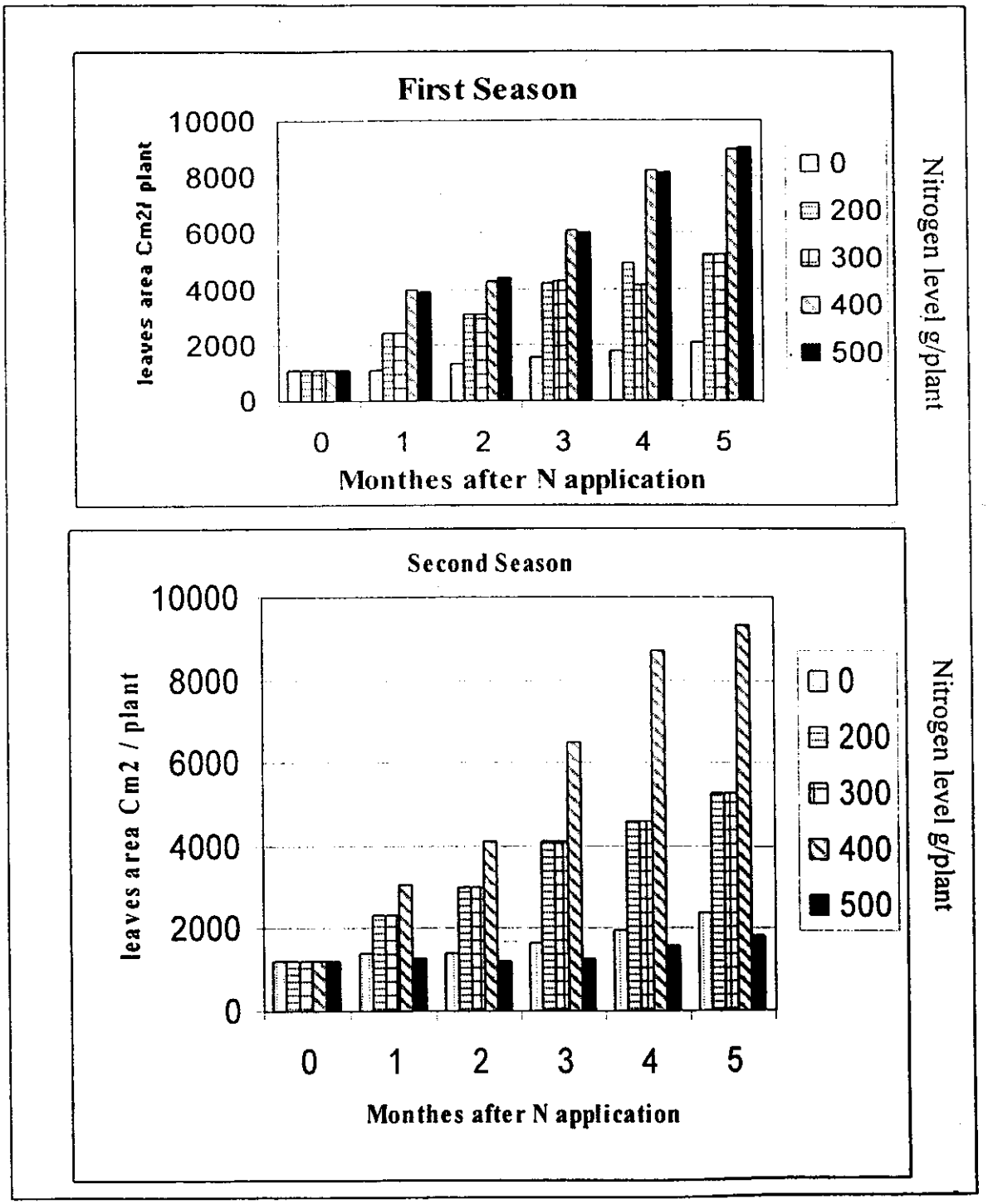

Fig. 2. Effect of different nitrogen fertilization rates on leaves area of purple passionfruit .

Number of leaves and No. of branches Fig. (3&4) had taken the same trend of vine length and leaves area of purple passionfruit in response to N fertilization. These results are in the harmony with those obtained by Aiyelaagbe *et al.* (2005) who mentioned that control plants had the fewest number of branches while plants of passionfruit that received 480 kg / ha produced the larger number of branches than those that received 240 kg / ha or lower rates of N.

As shown in Fig. 5, it can be noticed that N levees (200 , 300 gm / plant) did not affect significantly stem diameter and root length than the control. As for N doses 400 and 500 gm / plant , there was an significant increase . Generally it could be noticed that the high N levels are more effective than the lower rate and the control on increasing stem diameter and root length of passionfruit and that is true in both seasons of investigations except N level 500 gm / plant in the second year . This result agrees with the finding of Knight and Julian (2005) who mentioned that passion vines are heavy feeders but over fertilization will damage the roots. Contrary other results disagree with the finding of Aiyelaagbe *et al* (2005) who reported that stem diameter and root length were not significantly influenced by N rate. Moreover, rate of N and time after application whereas stem diameter and root length were not sensitive to N fertilization.

Fig. 6 show the effect of different levels of N fertilization on dry weight of passionfruit . It can be noticed that root dry weight was clearly significantly increased at N 400 , 500 g / plant in the first season than the low rate and the control . There were no significant differences between the two low levels 200 , 300 gm on increasing the root dry weight in the second year. In this respect the effect of (N 500 gm / plant) was less than all treatments in this year . This may be due to the accumulative residual effect of the high doses (N 500 g) after the two years . This agrees with the finding with Knight and Julian (2005) who mentioned that over fertilization will damage the roots and possibly destroy the plant . The response of leave and vine dry weight by increasing N doses had taken nearly the same trend of root dry weight. This results was disagree on root dry weight and agree on leaves d.wt with the finding with Aiyelaagbe *et al.* (2005) who mentioned that , similarly application of N 60 – 480 kg ha^{-1} did not significantly affect root dry weight compared with the control. Conversely the same application significantly influenced d.wt of leaves.

The yield of purple passionfruit as a number of fruits and fruit weight (g) were observed in Fig. 7, the low N rate fertilizer 300 g are significantly increase fruit weight / plant compared with the control. the weight of fruit / plant showed a highly significant increase when the level of N fertilizer was 400 and 500 except in the second season . Contrary as for the high N rate (400 – 500 g) it showed significant decrease on No. of fruit than low rate and the control , and that was true in the two seasons , except N 500 in the second season Generally these results may be due to the opposite relationship between the fruit weight and No. of fruit according to the high vegetative growth and low fruiting. N rates les than 400 / plant were generally too low to production significant yield. This result are agree with those obtained by Menzel *et al.* (1993) on passionfruit who indicated that a large variation on tree crops depending on the doses of N fertilization .

Conclusion

Nitrogen fertilizer was applied as ammonium sulfate (20.5 N) at the rate of 400 g / plant are important for growth and yield of purple passionfruit under the Egyptian conditions .

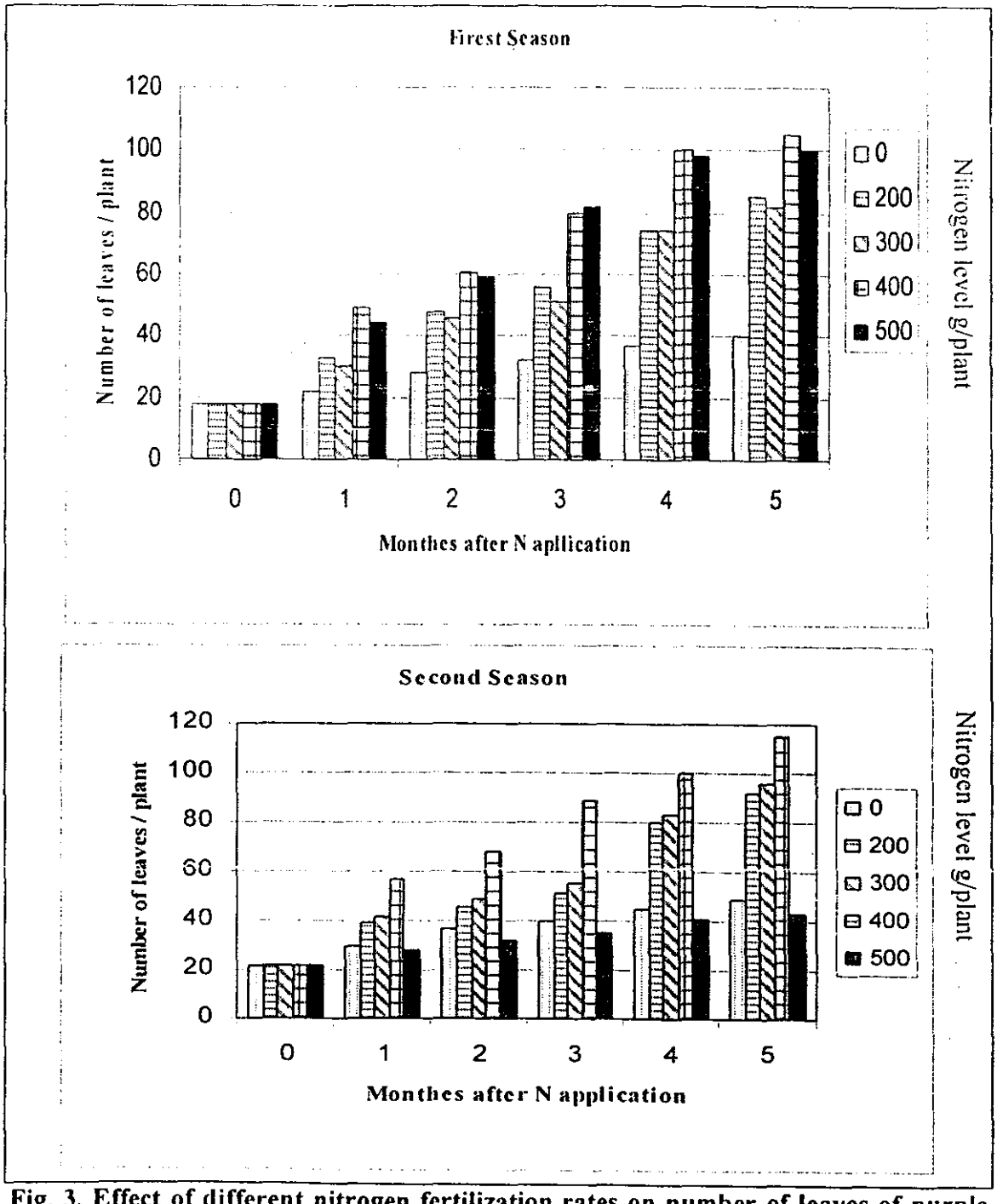

Fig. 3. Effect of different nitrogen fertilization rates on number of leaves of purple passion fruit.

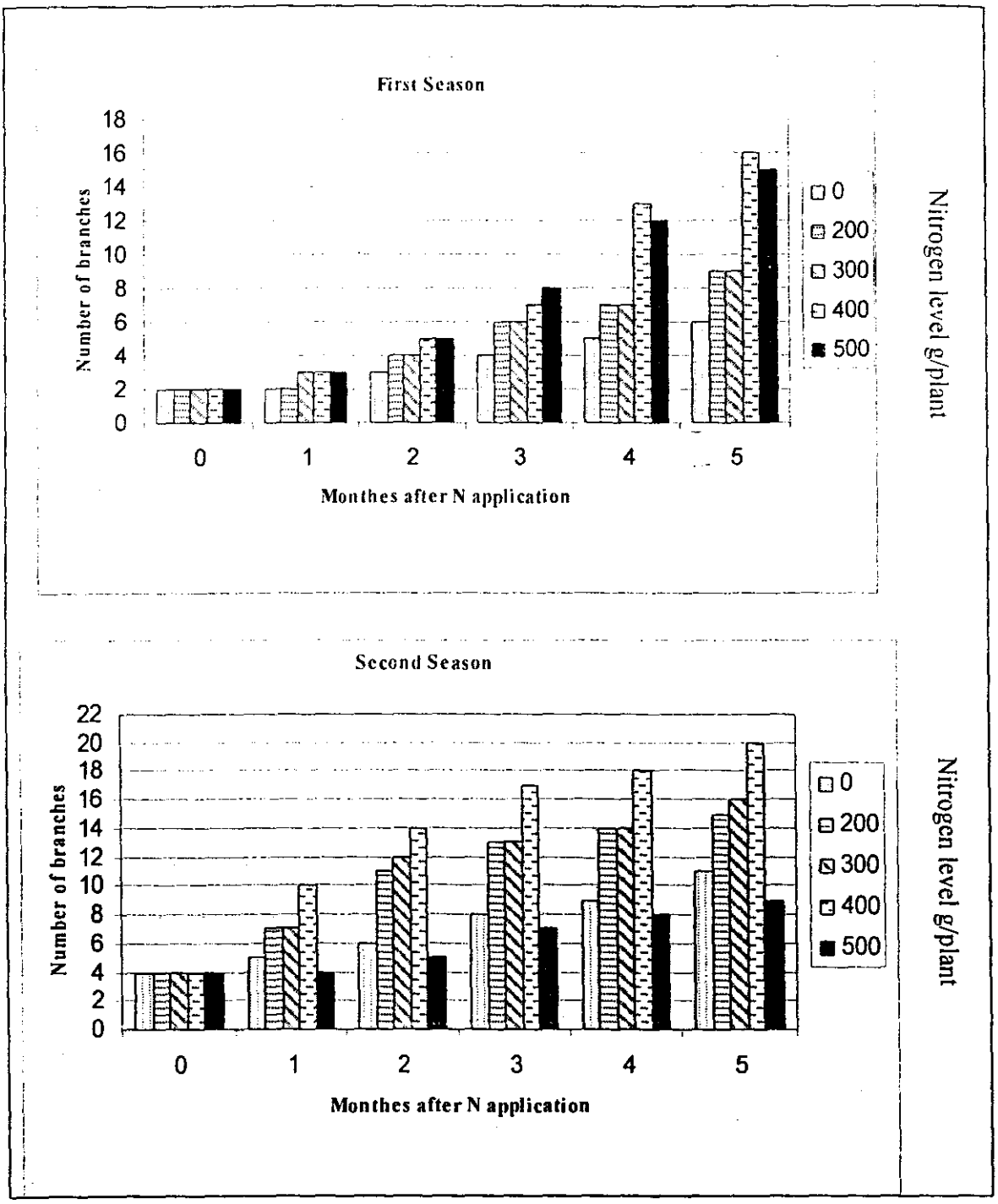

Fig. 4. Effect of different nitrogen fertilization rates on Number of branches of purple passion fruit.

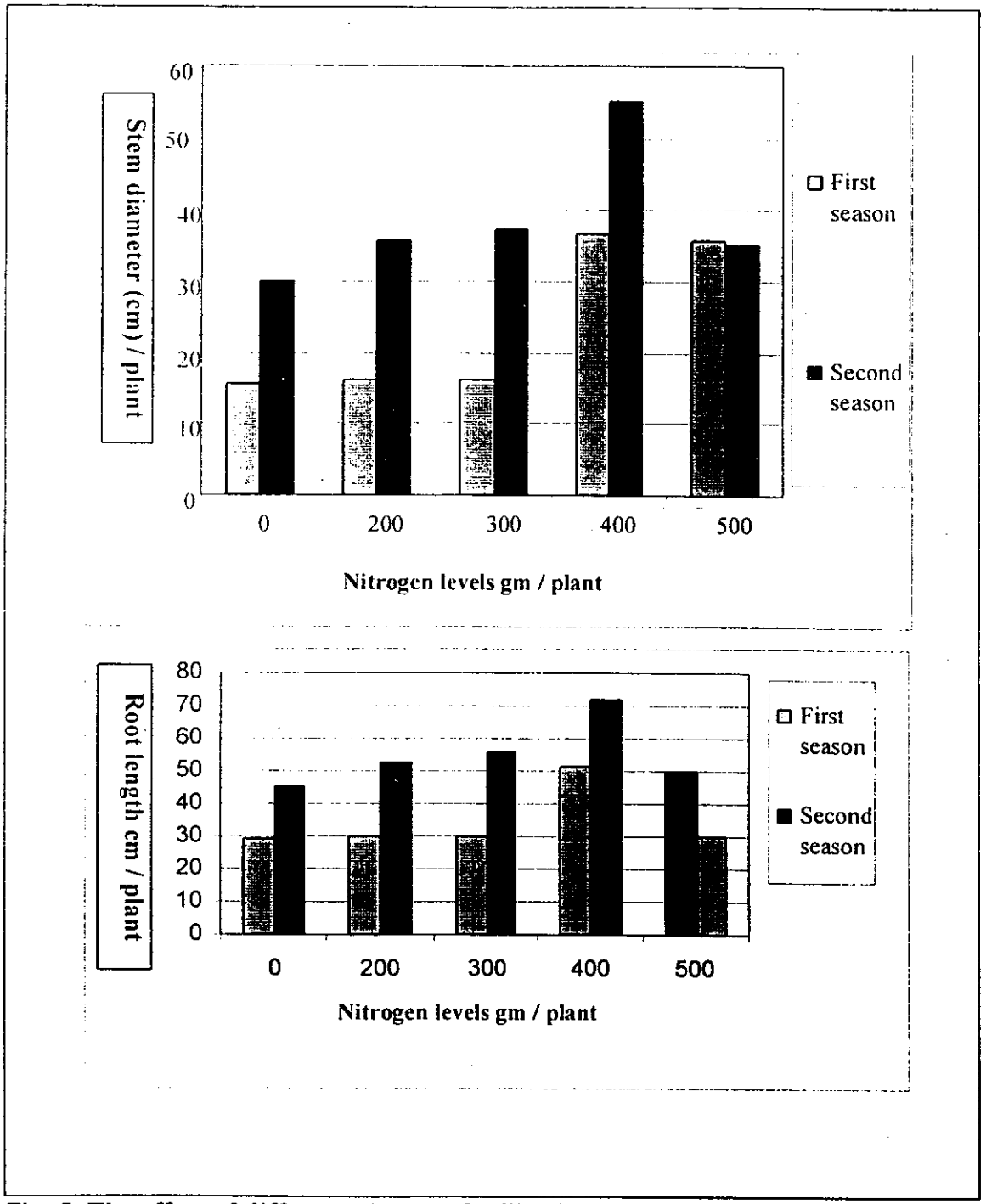

Fig. 5. The effect of different nitrogen fertilization rates on stem diameter and root length of purple passionfruit.

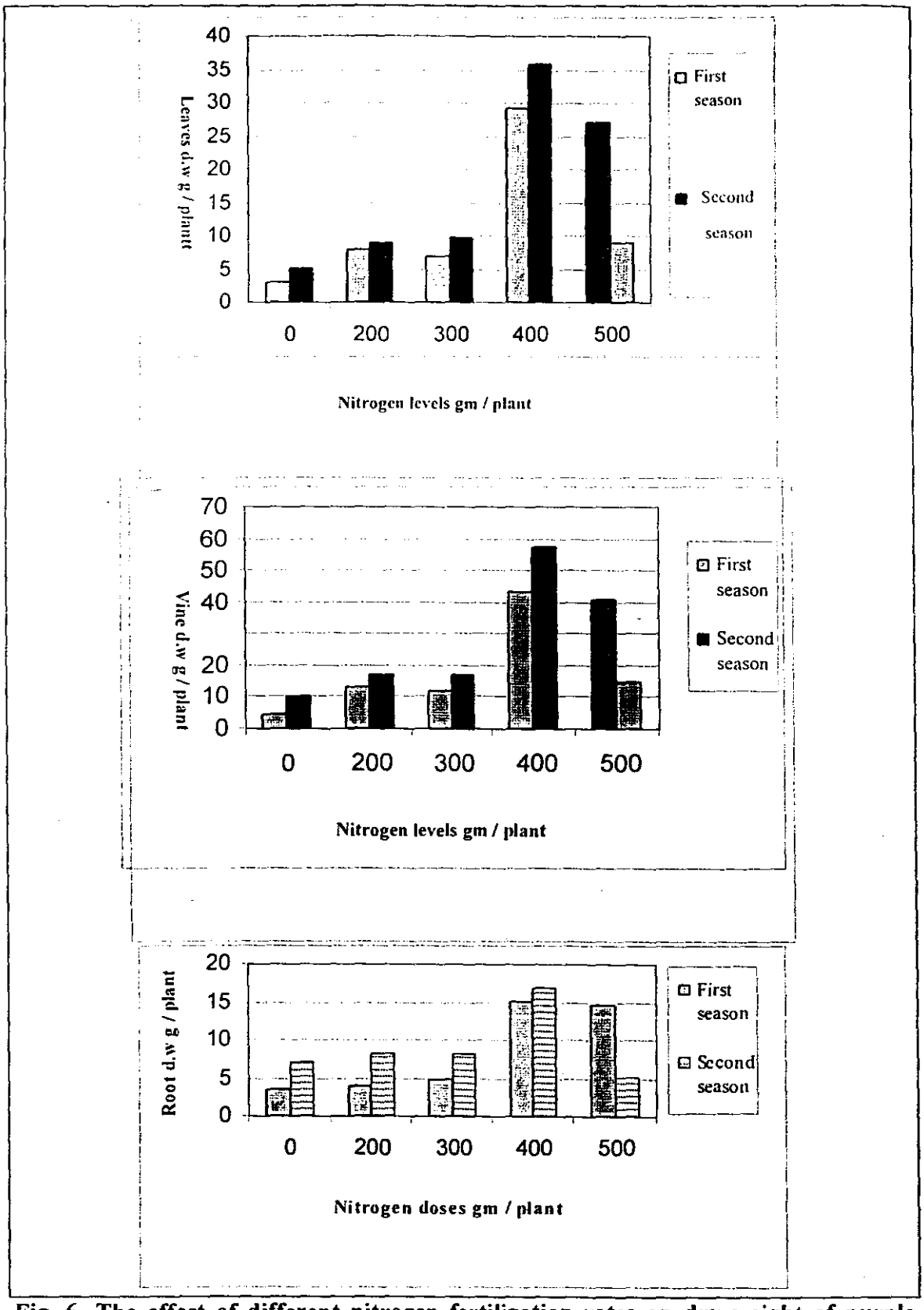

Fig. 6. The effect of different nitrogen fertilization rates on dry weight of purple passionfruit .

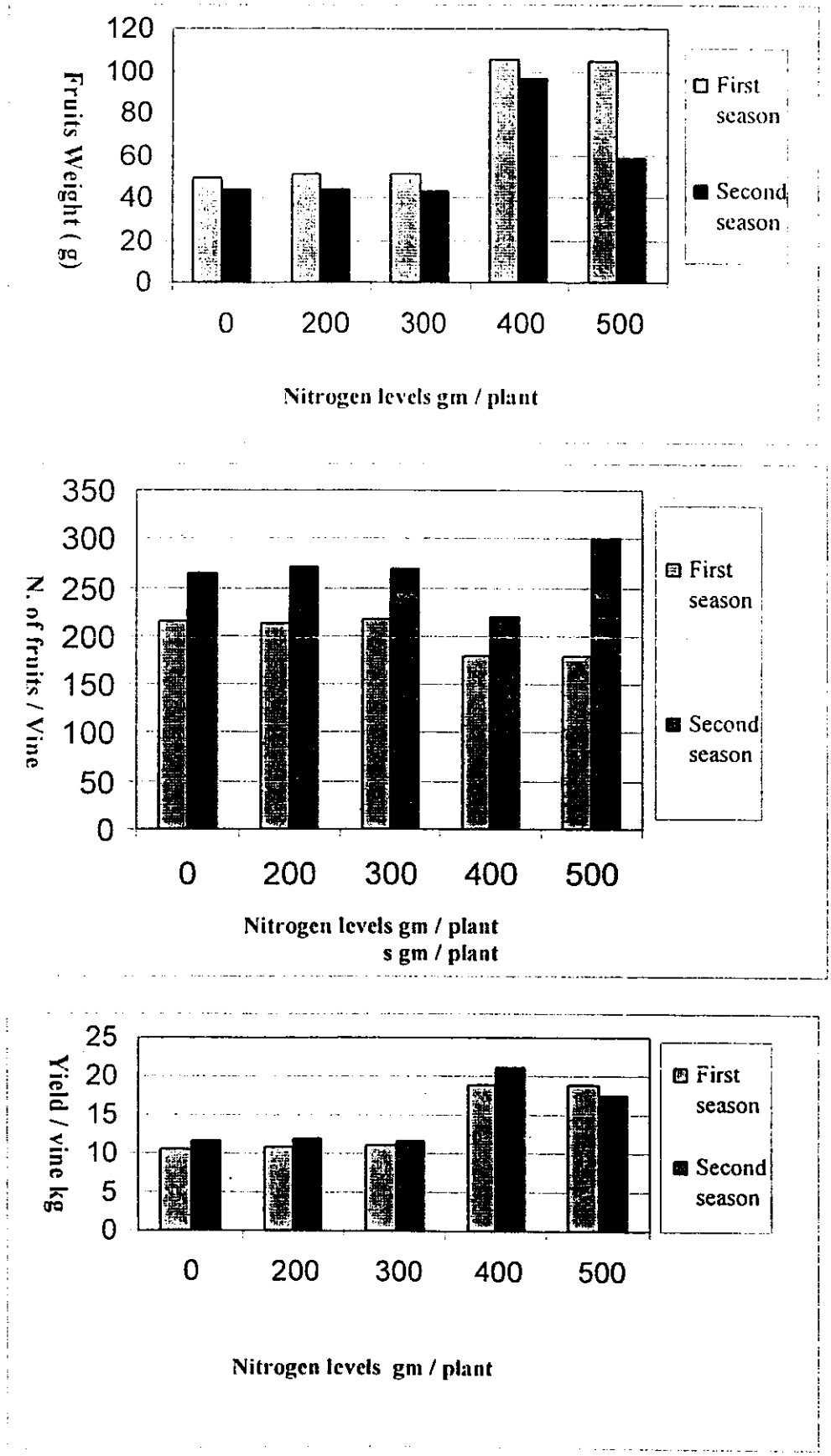

Fig. 7. The effect of different nitrogen fertilization rates on fruit weight, N. of fruits / vine and yield of purple passionfruit .

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تأثير التسميد النيتروجينى على نمو ومحصول نبات الباشون فروت تحت الظروف المصرية

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أجريت هذه الدراسة خلال موسمين متتالين هما (٢٠٠٦-٢٠٠٧) على نباتات الباشون فروت عمر ٣ سنوات المنزرعة في مزرعة خاصة بالمنصورية بمحافظة الجيزة لدراسة تأثير مستويات مختلفة من النيتروجين (٠, ٢٠٠, ٣٠٠ , ٤٠٠ ,٥٠٠ جرام / نبات) على النمو والمحصول.

وقد أوضحت النتائج ما يلي :

١- المعدل المرتفع من التسميد النيتروجينى (٤٠٠ جرام / نبات) كان أكثر معنوية في زيادة طول النبات ومساحة الورقة وعدد الأوراق و عدد الأفرع عن المعدلات المنخفضة والكنترول .

٢- المعدل المنخفض من النيتروجين ٢٠٠-٣٠٠ جرام / نبات لم يعطى أي تأثير معنوي على قطر الساق وطول الجذور عن الكنترول في السنة الأولى .

٣- فى السنة الأولى من التجربة كانت الزيادة في معدلات التسميد ٤٠٠،٥٠٠ جرام نيتروجين / نبات زيادة معنوية واضحة على كل من الوزن الجاف للأوراق وللنبات والجذور ووزن الثمرة بالمقارنة للمعدلات المنخفضة ٢٠٠،٣٠٠ والكنترول . على عكس عدد الثمار / نبات حيث أنه لوحظ قلة عدد الثمار لكل نبات في التركيزات المرتفعة ٤٠٠ و٥٠٠ عن التركيزات المنخفضة والكنترول وذلك في الموسمين فيما عدا معدل ٥٠٠ جرام نيتروجين / نبات في الموسم الثاني . بصفة عامة كانت أقل معدلات نمو للنبات خلال ال٥ شهور بعد الإضافة السمادية هو تركيز ٥٠٠ جرام في السنة الثانية فقط مقارنة بتركيزات ٢٠٠،٣٠٠،٤٠٠ جرام نيتروجين / نبات .

التوصية

أفضل معدل تسميد نيتروجينى لنبات الباشون فروت المنزرع تحت الظروف المصرية هو ٤٠٠ جرام نيتروجين لكل نبات .