VOL. 1, NO. 2, AUGUST 2006 ISSN 1990-6145
Journal of Agricultural and Biological Science

www.arpnjournals.com

EFFECT OF NITROGEN ON THE GROWTH AND YIELD OF ASPARAGUS (*Asparagus officinalis*)

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ABSTRACT

An experiment was conducted to study the effect of nitrogen i.e.0, 60, 90 and 120 kg ha^{-1} on the growth and yield of asparagus varieties Atlas, Grande, Purple Passion, Apollo, UC 157JI and Duke Verde at Horticultural Research Farm, Malakandher, NWFP Agricultural University, Peshawar during the years 2004 and 2005. The experiment was laid out as randomized complete block design with split plot arrangement with three replications. Variety Grande had significantly highest plant height (2.1m), number of spears $crown^{-1}$ (35.5), spear length (24.1cm), spear weight (34.0g) and yield ha^{-1} (41.25t) and minimum of these were recorded in Duke Verde. In nitrogen levels, 90 kg N ha^{-1} gave maximum plant height (2.3m), number of branches $plant^{-1}$ (12.2), plant weight (178.8g) and root weight $plant^{-1}$ (288.3g), number of spears $crown^{-1}$ (34.1), spear length (25.1cm), spear weight (32.2g) and yield ha^{-1} (37.9t) . In interaction between N levels and varieties, maximum number of spears $crown^{-1}$(57.6), spear length (26.2cm), spear weight (36.7g) and yield ha^{-1} (70.4t) were recorded for variety Grande supplied with 90 kg N ha^{-1}.

Keywords: asparagus, a*sparagus officinalis*, yield, growth, nitrogen.

INTRODUCTION

Asparagus *(Asparagus officinalis*), a genus of lily family, is one of the most delicate, wholesome, and appetizing products of the garden. Its early appearance in the spring, together with the fact that an asparagus bed when once established would produce for many years, makes it of special importance in the home garden as well as in the market garden and on the truck farm. It is an erect herb from a woody crown with long fleshy roots. On fertile soils and with suitable application of fertilizers and water it can produce for many years at one place.

The food value of asparagus is very important. The vitamin A content of green asparagus is higher than that of white or blanched asparagus. Both are relatively low in food value. Green asparagus contain 93g water, 26 calories energy, 22g protein, 21mg calcium, 700 I.U Vitamin A, 30mg ascorbic acid, 0.20mg thiamine, 0.16mg riboflavin and 1.0mg niacin per 100g edible portion. (MacGillivray, 1961).

Asparagus can be grown on nearly all kinds of soil, but a deep, loose soil is preferred. Sandy-loam and silt-loam soils are used to a large extent. On neutral or slightly alkaline soil asparagus is grown successfully. (Thompson and Kelly, 1959).The stems produced in spring are cut for eating, but later stems are allowed to grow and form fernlike foliage.

Nitrogen, phosphorus and potassium are among the common major nutrients, which are essential for the growth and development of all plant species. There are various ways for improving yield and quality of asparagus but the best way to improve the yield and quality is to apply appropriate amount of fertilizers and to select high yielding varieties.

Tewari and Misra (1996) found increase in root number with application of 60 kg N and 30 kg P_2O_5 $_{ha}^{-1}$. Krug and Kailuweit (1999) evaluated the effects of N fertilizers at doses of 50, 75, 100 and 200kg ha^{-1} on asparagus yield. The results showed that in 3 out of 4 cases, the greatest yield were obtained with the lowest fertilizer dose. Sanders and Benson (1999) supplied 0, 50, 100, 150 or 200kg N ha^{-1} + 0, 50, 150, 250 and 350 kg K_2O ha^{-1} to all male asparagus hybrid jersey Gem. Cumulative yield increased with up to 150kg N ha^{-1} and 150kg K_2O ha^{-1}

Paschold (1999) planted asparagus Cv. Huchtels AM33 at 1300 Plants ha^{-1} on sandy soil at Ingelheim in 1986 and fertilized with mineral N every June to give N concentrations of 30, 60, 90 and 120kg ha^{-1}. It was concluded that N fertilization should be based on analysis of soil N, especially if organic fertilizers are used. Excessive N supply can result in less vigorous spears and N deficiency reduces quality. Soil N concentrations of 90kg ha^{-1} in the 0-90cm layer after the third year of cultivation are recommended both for optimum plant growth and minimum ground water contamination.

Hikasa (2000) studied the factors for reducing the productivity of asparagus in Japan, and measures to improve productivity. Plants from poor fields exhibited reduced root distribution compared with plants from productive fields. For good production, plants required 200kg N, 60kg P_2O_5 and 120kg K_2O ha^{-1} annually. Although plants exhibited good photosynthesis and distribution of sugars to roots throughout growth, harvesting over too long a period reduced yield. It was concluded that to achieve high productivity of asparagus, methods to promote root growth and accumulation of sugars in roots should be conducted with adequate soil management/fertilization. Spears should not be harvested over too long a period, otherwise plant vigour and production in subsequent years can be reduced.

Nicola (2000) investigates the effect of N concentration (4, 8, 15, 30 and 60 mM in nutrient solution, applied 5 times) on asparagus cv. Gijnlim seedlings. Shoot number and area, shoot, root and total dry weight and

relative growth rate increased with increasing N concentration.

Keeping in view the importance of nitrogen, an experiment was laid out, to see the effect of various levels of nitrogen on different varieties of asparagus and to select high yielding variety and optimum dose of nitrogen for high production of quality asparagus spears.

MATERIALS AND METHODS

Research studies on the "effect of different levels of nitrogen on the growth and yield of different varieties of asparagus" were conducted at Horticultural Research Farm, Malakandher, NWFP Agricultural University, Peshawar during the year 2004 and 2005. The crowns of the plants were divided and planted in rows 1m apart and 30cm within the rows. A uniform dose of single super phosphate @100g plant^{-1} was applied at the time of planting. The source for nitrogen was Urea. Nitrogen at 4 levels was applied a month after transplanting. Subsequent irrigations were applied as required by the crop. Hoeing and weeding were done regularly.

The experiment was laid out in Randomized Complete Block (RCB) design with split plot arrangement. There were four levels of nitrogen and six varieties of asparagus. Experiment was replicated 3 times. Different varieties were assigned to main plot and various level of nitrogen to sub plot. Number of plants per treatment was 15. Total number of plants per replication was 360. There were 3 rows and 5 plants per row in each plot. The plot size was 4.5m^2. In main plot varieties Atlas, Grande, Purple Passion, UC157JI and Duke Verde were planted and in sub plots nitrogen @ 0, 60, 90 and 120kg ha^{-1} was applied.

A composite soil sample was collected from experimental plot (0-30cm deep) before fertilizer application for analysis. The soil texture was clay loam (0.72% organic matter, 0.1% total N and 9.1 pH).

Data on plant height was measured with the help of measuring tap from the soil surface to the top of the plant in December. Numbers of branches were counted in middle row in each treatment for plant and root weight. Plants and roots of 5 randomly selected plants were weighed. Number of spears per plant was counted for all treatments in each picking and average number of spears per plant was calculated. The length of the 10 randomly selected spears in each treatment was measured with the help of measuring tape and average length per spear was calculated. For spear weight, 15 randomly selected spears per treatment and per replication were weighed and mean spear weight was recorded. Total yield per plot of each treatment was converted to yield per hectare.

RESULTS AND DISCUSSION

Plant height:

It is evident from Table-1 that nitrogen levels, varieties and their interaction significantly affected plant height.

Table-1. Effect of varieties and nitrogen on plant height (m) of Asparagus.

Varieties	Nitrogen (kg ha^{-1})				Mean
	0	60	90	120	
Atlas	1.5 J	1.8 GH	2.0 EF	1.8 GH	1.8B
Grande	1.8 GH	2.3 BC	2.5 A	2.0 EF	2.1A
Purple passion	1.9 FG	2.2 CD	2.4 A	2.0 EF	2.1A
Apollo	1.6 IJ	2.1 DE	2.4 ABC	2.2 CD	2.1A
UC 157 J1	1.7 HI	2.2 CD	2.4 AB	2.3 ABC	2.2A
Duke Verde	1.3 K	1.5 J	1.8 GH	1.6 IJ	1.5C
Mean	1.6C	2.0B	2.3A	2.0B	

LSD value at 1% for varieties = 1.2
LSD value at 1% for nitrogen = 1.1
LSD value at 1% for interaction = 1.1
Means followed by different letter are significantly different using LSD test at 1% level of probability.

The mean values for different nitrogen levels revealed that maximum plant height of 2.2m was recorded with application of 90kg N ha^{-1} and minimum plant height of 1.6m in control. Height increased with increasing doses of nitrogen up to 90kg N ha^{-1}. This may be due to optimum level of nitrogen in the soil which has shown positive response and let the plants to grow according to genetic make up and both deficient and excessive nitrogen reduced plant height by suppressing growth (Haynes *et al.* 1986).

In varieties, the tallest plants (2.2m) were observed in Grande while the shortest stature plants (1.5m) in Duke Verde. The vigorous or slow growth of the plants of varieties may be due to varietals differences and their inherited characteristics. Similarly the lesser growth in Duke Verde may be due to minimum number of branches

per plant and more competition among plants for nutrients that reduced the rate of photosynthesis, thereby reducing plant growth.

Like wise in interaction, plants of variety Grande treated with 90kg N ha^{-1} gave maximum height (2.5m) and minimum (1.3m) was observed in variety Duke Verde in control treatment. The increase /decease of the plant height may be due to varietals character and also deficiency of nitrogen in soil.

Number of branches $plant^{-1}$:

It is evident from Table-2 that number of branches was significantly affected by nitrogen levels, varieties and their interaction.

Table-2. Effect of varieties and nitrogen on number of branches $plant^{-1}$ of Asparagus.

Varieties	Nitrogen (kg ha^{-1})				Mean
	0	60	90	120	
Atlas	10.4	11.5	12.3	11.6	11.5
Grande	10.8	11.8	13.4	12.2	12.0
Purple passion	9.5	10.4	11.8	11.8	10.9
Apollo	9.4	10.6	11.7	10.0	10.4
UC 157 J1	9.7	10.8	11.8	10.1	10.6
Duke Verde	9.3	10.4	11.8	10.5	10.5
Mean	9.8 D	10.9 C	12.2 A	11.0 B	

LSD value at 1% for nitrogen = 1 .11

The mean values of nitrogen levels revealed that maximum number of branches $plant^{-1}$ (12.2) was counted on the plants treated with 90kg N ha^{-1} and minimum number of branches (9.8) in control. The maximum number of branches might be due to regular supply of nitrogen that enhanced vegetative growth and deficiency of nitrogen resulted in poor vegetative growth. Nicola (2000) reported that moderate nitrogen application considerably increased number of branches.

By comparing mean values of varieties, maximum numbers of branches (12.0) were counted on the plants of Grande and minimum numbers of branches (10.4) were produced in variety Apollo. These differences may be due to difference in genetic makeup of different varieties.

In interaction between nitrogen levels and varieties, highest numbers of branches (13.4) were counted for plants in Grande supplied with 90kg N ha^{-1}. The lowest numbers of branches (9.3) were observed in control treatment in Duke Verde. This shows that the main factor is nitrogen that influences number of branches. It might be due to optimum fertilization that resulted in best plant growth and minimum number of branches might be due to the deficiency of nitrogen that ceased vegetative growth (Haynes et al. 1986).

Root weight:

It is evident from Table-3 that significant difference was found in root weight of varieties and the effect of nitrogen and their interaction was non significant.

Table-3. Effect of varieties and nitrogen on root weight per plant (g) of Asparagus.

Varieties	Nitrogen (kg ha^{-1})				Mean
	0	60	90	120	
Atlas	252.4	284.7	300.1	271.6	277.2
Grande	283.8	297.2	303.3	292.9	294.3
Purple passion	260.2	278.5	286.6	260.0	271.3
Apollo	264.7	269.2	276.6	264.4	268.7
UC 157 J1	261.6	267.6	280.3	279.4	272.2
Duke Verde	270.0	278.9	282.8	274.0	276.4
Mean	265.5C	279.3A	288.3A	273.7B	

LSD value at 1% for nitrogen = 7.38

Comparing the mean values of different levels of nitrogen, it is revealed that more root weight was recorded for the plants fertilized with 90kg N ha^{-1} but decreased beyond this level of nitrogen. Optimum application of nitrogen increased number of branches that enhanced the rate of photosynthesis and photosynthates accumulation which resulted in maximum root weight. The results are in agreement with the findings of Tewari and Misra (1996) and Nicola (2000) who reported that increasing application of nitrogen beyond optimum level did not increase root number and root weight. Hikasa (2000) stated that to achieve high productivity of asparagus accumulation of sugars in roots should be conducted with adequate soil fertilization. The minimum root weight $plant^{-1}$ (265.5g) was observed in control plots. The minimum root weight may be due to deficiency of nitrogen, which ceased vegetative growth by suppressing photosynthetic activity (Haynes *et al*.1986).

By comparing the mean values of varieties, maximum root weight $plant^{-1}$ (294.3g) was recorded for the plants of Grande and minimum root weight $plant^{-1}$ (268.7g) was produced by the plants of Apollo. The increase/decrease in root weight is related with the number of branches and plant weight.

Mean values for interaction between nitrogen levels and varieties showed that maximum root weight $plant^{-1}$ (303.3g) was recorded in variety Grande received 90kg N ha^{-1}. On the other hand, minimum root weight $plant^{-1}$ (252.4g) was recorded in variety Atlas in control treatment. The increase in root weight by moderate level of nitrogen may be due to proper plant growth and development.

Plant weight:

The data recorded on plant weight in Table-4 revealed significant effect of nitrogen levels, varieties and their interaction.

Table-4. Effect of varieties and nitrogen on plant weight (g) of Asparagus.

Varieties	**Nitrogen** (kg ha^{-1})				**Mean**
	0	**60**	**90**	**120**	
Atlas	68.6 KL	76.5 JKL	108.9 EF	83.2 HIJKL	84.3D
Grande	110.2 L	152.7 IJKL	195.8 FGHI	133.8 KL	143.7A
Purple passion	133.5 EF	152.1 C	195.4 AB	133.5 CD	147.8A
Apollo	80.4 IJKL	148.9 C	213.5 A	102.1 FGH	136.2AB
UC 157 J1	72.0 KL	103.8 FG	178.8 B	92.6 FGHIJ	111.8C
Duke Verde	87.2 GHIJK	110.5 EF	180.6 B	125.5 DE	125.9BC
Mean	88.1D	124.1B	178.8A	111.7C	

LSD value at 1% for varieties = 16.21
LSD value at 1% for nitrogen = 7.878
LSD value at 1% for interaction = 19.30

The data regarding different nitrogen levels revealed that plant weight increased with increased nitrogen level up to 90kg N ha^{-1} but it was dropped beyond this level of nitrogen. Maximum plant weight of 162.7g was recorded with 90kg N ha^{-1}. The maximum plant weight may be due to increased number of branches and plant height that enhanced photosynthetic activity and thus resulted in increased plant weight. It might also be due to the optimum amount of nitrogen, which might have increased vegetative growth of the plant and subsequently increased the plant weight. The results are in agreement with the finding of Paschhold (1999) who recommended 90kg N ha^{-1} for optimum plant growth and Nicola (2000) who reported that plant growth and weight increased with increasing nitrogen concentration up to certain limit. The minimum plant weight (81g) was found in control plot. This may be due to nitrogen deficient conditions that offered poor nutrition to the plants that resulted in poor growth of plant parts.

By comparing the mean values of varieties, maximum plant weight (148.1g) was found for the plants of Grande. This might be due to maximum plant height and more number of branches in this variety. Plant weight related with total of number branches and plant height. The minimum plant weight (84.3g) was found for the plants of variety Atlas. In interaction, maximum plant weight (213.5g) was recorded in Apollo supplied with 90kg N ha^{-1} and minimum plant weight (68.6g) was noted in Atlas in control plot. Explanations have already been given in the pervious paragraphs.

Number of spears $plant^{-1}$:

Data recorded on number of spears revealed that nitrogen levels, varieties and their interaction significantly affected number of spears (Table-5). The data related to the nitrogen levels revealed that nitrogen level increased number of spears up to 90kg N ha^{-1}, however, further increase in nitrogen beyond this level did not increase number of spears per plant, which is in line with law of diminishing return. However, minimum number of spears $plant^{-1}$ (12.9) was counted in control treatment and maximum number of spears $plant^{-1}$ (34.1) with application of 90kg N ha^{-1}. This might be due to the fact that application of nitrogen helps in the formation of

chlorophyll which resulted in increased vegetative growth and provided balance nutrition and excellent environment to the root system of the plants; as a result more number of spears per plant was obtained at this nitrogen level.

Means of varieties revealed that maximum number of spears plant^{-1} (35.5) was recorded in variety Grande followed by 24.3 in variety Purple passion and minimum number of spears plant^{-1} (15.8) was noted in Duke Verde. The maximum number of spears in variety Grande might be due to more root and plant weight which encouraged more number of spears.

In interaction, the maximum number of spears plant^{-1} (57.6) were produced in variety Grande supplied with 90kg N ha^{-1} and minimum number (9.6) were counted in variety Duke Verde in control treatment. The increase in number of spears is due to better root and shoots growth and more accumulation of carbohydrates.

Table-5. Effect of varieties and nitrogen on number of spears plant^{-1} of Asparagus.

Varieties	Nitrogen (kg ha^{-1})				Mean
	0	60	90	120	
Atlas	12.8KL	19.5GHI	31.7C	18.3GHIJ	20.6BC
Grande	16.6HIJK	40.7B	57.6A	27.1DE	35.5A
Purple passion	14.3JK	24.4EF	37.4B	21.0FGH	24.3B
Apollo	12.2KL	20.3FGH	24.5EF	21.3FG	19.6C
UC 157 J1	12.1KL	21.6FG	29.6CD	21.2FG	21.1BC
Duke Verde	9.6L	15.4IJK	24.1EF	14.2JK	15.8D
Mean	12.9D	23.6B	34.1A	20.5C	

LSD value at 1% for varieties = 3.697
LSD value at 1% for nitrogen = 1.855
LSD value at 1% for interaction = 4.544

Spear length:

Data recorded on spear length (Table-6) revealed that nitrogen levels, varieties and interaction had significant effect on spear length.

Table-6. Effect of varieties and nitrogen on spear length (cm) of asparagus.

Varieties	Nitrogen (kg ha^{-1})				Mean
	0	60	90	120	
Atlas	18.6G	25.1CDE	26.1AC	24.3E	23.6AB
Grande	20.7F	24.1E	26.2A	24.5E	24.1A
Purple passion	18.5G	19.8E	22.3AB	20.15E	23.30B
Apollo	17.5GH	24.2E	26.1AC	24.8DE	23.4AB
UC 157 J1	16.8H	21.4BD	21.4AB	22.0CD	23.3B
Duke verde	16.9H	18.4G	18.2G	17.8G	18.1C
Mean	18.2C	23.6B	25.1A	23.6B	

LSD value at1% for varieties = 0.7455
LSD value at 1% for nitrogen = 0.5317
LSD value at 1% for interaction = 1.302

The mean values of the nitrogen levels pertaining to spear length show that spear length increased with increase in nitrogen level up to 90kg N ha^{-1} and decreased with further increased in nitrogen. The maximum spear length (25.1cm) was recorded with application of 90kg N ha^{-1}. Nitrogen is a constituent of all proteins (Haynes *et al.*1986) that is why with the increase of nitrogen spear length increased due to accumulation of carbohydrates and photosynthates. The results are in agreement with the findings of Paschold (1999) who reported that excessive nitrogen supply can result in less vigorous spears and nitrogen deficiency reduces quality, so optimum nitrogen

(90kg ha^{-1})is required for optimum spear growth. The minimum spear length (18.2cm) was noted in control plots. It may be due to deficiency of nitrogen.

In varieties, maximum spear length (24.1cm) was recorded in variety Grande and minimum spear length (18.1cm) in Duke Verde. These differences might be due to variation in genetic makeup among the varieties and their response to prevailing weather conditions and adoptability status.

In interaction maximum spear length (26.9cm) was noted in variety Grande supplied with 90kg N ha^{-1} and minimum spear length (16.8cm) in variety UC157 J1 in control treatment. The maximum spear length may be due to optimum supply of nitrogen and minimum spear length may be due to deficient or toxic level of nitrogen.

Spear weight:

Nitrogen levels, varieties and interaction significantly affected on spear weight (Table-7).

Table-7. Effect of varieties and nitrogen on spear weight (g) of asparagus.

Varieties	Nitrogen (kg ha^{-1})				Mean
	0	60	90	120	
Atlas	22.4G	31.5CDE	35.9A	34.4ABC	31.1 B
Grande	30.6EF	34.8AB	36.7A	33.8ABCD	34.0 A
Purple passion	20.9G	32.1BCDE	35.9A	34.1ABCD	30.7 B
Apollo	17.1HI	28.3F	31.9BCDE	30.3EF	26.9 C
UC 157 J1	15.57I	31.1DEF	32.3BCDE	30.4EF	27.3 C
Duke Verde	15.6I	19.6GH	20.7G	19.6GH	18.9 D
Mean	20.3C	29.5B	32.2A	30.4B	

LSD value at1% for varieties = 1.518
LSD value at1% for nitrogen = 1.299
LSD value at 1% for interaction = 3.182

Significant increase was observed with an increased level of nitrogen up to 90kg N ha^{-1} but it was dropped beyond this level of nitrogen. The maximum spear weight (32.3g) was produced by the plants supplied with 90kg N ha^{-1} and minimum (20.4g) was recorded in plants received no nitrogen. Both deficiency and excess of nitrogen adversely affected spear quality by suppressing spear development. As nitrogen is the main component of amino acid so its increasing application favour vegetative growth and resulted in increase spear weight, however excess amount have adverse effect on the growth, which is in line with law of diminishing return. The results are in agreement with the findings of Paschold (1999) who reported that excess nitrogen supply can result in less vigorous spears and nitrogen deficiency reduces quality.

In varieties, maximum spear weight (34.0g) was recorded in variety Grande, which might be due to maximum spear length. The minimum spear weight (18.9g) was produced by Duke Verde which may also be due to minimum spear length

In interaction of nitrogen levels and varieties, maximum spear weight (36.7g) was recorded in variety Grande supplied with 90kg N ha^{-1}. The maximum weight may be due to maximum growth of spears. The minimum spear weight (15.6g) was recorded in variety UC 157 J1 in control treatment, which might be due to minimum spear length.

Yield ha^{-1}:

The data recorded on yield ha^{-1} (tons) was significantly affected by nitrogen levels, varieties and interaction of the two factors (Table-8). Yield increased with increase of nitrogen up to 90kg ha^{-1} but decreased with further increase. The maximum yield ha^{-1} (37.9t) was recorded with 90kg N ha^{-1}. The increase in yield may be due to better response of plants to moderate dose of nitrogen, more vegetative growth of the aerial plant parts, excellent environment to the root system, maximum spear weight and more number of spears. The results are in agreement with the findings of Kruge and Kailuweit (1999) and Sanders and Bensen (1999) who reported that greatest yield can be obtained with optimum nitrogen dose. Minimum yield ha^{-1} (9.3t) was observed for untreated plants. The minimum yield ha^{-1} might be due to less vegetative growth of the aerial plant parts and poor environment to the root system of this treatment. At lower doses the nutrients were not available to plants in sufficient quantities that suppressed the growth and thus reduced yield. Similarly high dose of nitrogen decreased yield by suppressing fertilizer uptake efficiency of plants (Haynes *et al*.1986).

In varieties, maximum yield ha^{-1} (41.3t) was observed in variety Grande and minimum yield ha^{-1} (10.2t) in variety Duke Verde. The maximum yield the increase/decrease in yield is related with increase/decrease of spears number and spear weight $plant^{-1}$.

In the interaction, the maximum yield ha^{-1} (70.4t) was recorded in variety Grande supplied with 90kg N ha^{-1}

and minimum (4.9t ha^{-1}) in variety Duke Verde in control. Increase/decrease is due to number and weight of spear plant^{-1}.

Table-8. Effect of varieties and nitrogen on yield ha^{-1}(tones) of asparagus.

Varieties	Nitrogen (kg ha^{-1})				Mean
	0	60	90	120	
Atlas	10.77J	20.43GHI	37.95C	21.05GHI	22.55BC
Grande	16.87HI	47.23B	70.35A	30.53DE	41.25A
Purple passion	9.96J	26.12EF	44.71B	23.73FG	26.13B
Apollo	6.94JK	19.15GHI	26.07EF	21.55FGH	18.43D
UC 157 J1	6.26JK	22.35FG	31.82D	21.52FGH	20.49CD
Duke Verde	4.94K	10.04J	16.46I	9.33JK	10.19E
Mean	9.29D	24.22B	37.89A	21.29C	

LSD value at 1% for varieties = 3.783
LSD value at 1% for nitrogen = 2.042
LSD value at 1% for interaction = 5.003

CONCLUSION AND RECOMMENDATIONS

The role of nutrition cannot be ignored in modern agriculture. The requirements of the species or even the varieties vary and therefore, experiments regarding the role of different varieties to different nitrogen levels should regularly be conducted for different species under different ecological zones to find out an optimum level of nutrition for maximum plant growth and production. Among the various varieties Grande was superior in production of quality spear. With regard to various nitrogen levels 90kg ha^{-1} appeared as the best dose for getting more yields of quality asparagus.

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