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## Research Article

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## Response of Okra to Various Levels of Applied Nitrogen and Phosphorus Fertilizers

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### Abstract

To determine the effects of the different amount of fertilization (Nitrogen and Phosphorus) on Okra (*Abelmoschus esculentus* L.), a field trial was conducted at Soil and Water Testing Laboratory, Charsadda in April 2017. The composite sample was taken for comparison. N and P<sub>2</sub>O<sub>5</sub> fertilizers were applied at the rate of 0-0, 100-20, 100-40, 100-60, 100-90 kg ha<sup>-1</sup> from Urea and Single Super Phosphate, respectively. Results revealed that the combination of different treatments showed a significant effect on yield and yield parameters of okra crop. Results revealed that Okra give significant maximum yield (11.85 T ha<sup>-1</sup>) at (100-40 kg ha<sup>-1</sup> N-P), Plant height (91.44 cm) at of 100-90 kg ha<sup>-1</sup> N-P, Number of leaves Plant<sup>-1</sup> (43.67) at 100-90 kg ha<sup>-1</sup> N-P, Branches plant<sup>-1</sup> (8.33) at 100-40 kg ha<sup>-1</sup> N-P, Days to flowering (66.33) at 100-90 kg ha<sup>-1</sup> N-P, Survival percentage (88.24 %) at 100-20 kg ha<sup>-1</sup> N-P and Single Pod Weigh (13.53 g) at 100-90 kg ha<sup>-1</sup> N-P fertilization rate. The optimum response of okra was achieved at 100-40 kg ha<sup>-1</sup> dose of nitrogen and phosphorus fertilizers followed by 100-60 kg ha<sup>-1</sup>. Finally, it was concluded from the trial that, the dose of 100-40 N, P<sub>2</sub>O<sub>5</sub> kg ha<sup>-1</sup> was found useful for okra crop in terms of growth and yield under the prevailing conditions of Charsadda.

### Introduction

One of the reasons of low yield in Pakistan is improper management particularly use of imbalanced fertilizers if okra crop is properly managed, have the potential to produced continuously throughout the year. Nitrogen application significantly increased the number of seeds pod<sup>-1</sup>, green pod yield, pod diameter, number of fruits plant<sup>-1</sup> and pod weight. Phosphorus fertilizer application increased green pod yield, pod number and number of seeds pod<sup>-1</sup> [1]. Application of 150 kg N ha<sup>-1</sup> + 90 kg P ha<sup>-1</sup> in combination resulted in a higher yield of okra [2] showed that seed germination was not affected statistically by fertilizer application while plant height, number of leaves plant<sup>-1</sup>, number of pods plant<sup>-1</sup>, pod length and green pod yield were affected significantly and were highest at the highest level of fertilizers [3]. Phosphorus is associated with root growth and root health, increase tolerance to root-rot disease,

increase fruit quality, creates disease resistance, stimulate growth and give early maturity [4]. Nitrogen fertilizer is used for vegetable production has increased by 21% [5]. However, proper attention must be given to these nutrients while planning a project on plant nutrition [6] specifically on vegetable crops.

### Materials and Methods

A field trial was conducted at the Soil and Water Testing Laboratory, Charsadda during April 2017. The experimental site is located at 302m above the sea level at Charsadda (34.1682° N, 71.7504° E). The experimental soil was silt loam in texture having low moisture content and low bulk density, non-saline in nature, slightly alkaline in reaction and moderately calcareous, low in organic matter content, deficient in nitrogen and phosphorus, which need an appropriate amount of nitrogenous and phosphatic

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fertilizers (Table 1). Prior to planting, ten core soil samples, randomly collected from 0-15 cm soil depth were bulked inside a plastic bucket to form a composite sample and was analyzed for various physicochemical properties. The 1<sup>st</sup> factor was Nitrogen levels and the 2<sup>nd</sup> was Phosphorous levels which were applied at the rate of 0-0, 100-20, 100-40, 100-60, 100-90 kg ha<sup>-1</sup>, from urea and single superphosphate, respectively. Okra (NHAc47-4) seeds variety was sown in the randomized complete block design with three replications. Four seeds of okra were planted per hole at a spacing of 60 cm x 30 cm and were later thinned off to one seedling per stand. Weeding and other agronomic practices were carried out properly when and where required.

Data was collected on growth parameters

1. Fruit Yield
2. Plant height
3. Number of leaves per Plant
4. Number of branches plant<sup>-1</sup>
5. Days to flowering
6. Survival %age
7. Single pod weight

As described by [7]. Difference in mean were illustrated using least significant difference (LSD) test at 5% level of probability.

**Table1:** Physico-chemical characteristics of experimental soil.

Properties	Unit	Values
Soil texture	—	Silt loam
Moisture	%	12.0
Bulk density	gcm <sup>-3</sup>	1.18
Electricity conductivity (1:5)	dsm <sup>-1</sup>	0.41
pH(1:5)	—	7.65
Lime	%	12.0
Organic matter	%	0.85
Carbon	%	0.49
Nitrogen	%	0.04
Phosphorus	mgkg <sup>-1</sup>	4.48

## Results and Discussion

### Fruit yield

NP fertilizers have significant effect on the yield of okra. Treatments 100-20, 100-40, 100-60, 100-90 kg ha<sup>-1</sup> showed mean yield of okra plant of 8.86, 11.85, 10.25 and 8.07, tha<sup>-1</sup> respectively while in comparison control showed 6.62. Results indicated the optimum NP fertilizers rate was 100-40 which gave significantly higher yield than other levels of NP fertilizers (Table 2). Our work is in agreement with the early work of [1,8] also reported that different levels of nitrogen and phosphorus fertilizers in combination significantly affect the yield and growth of okra.

### Plant height

Results showed that NP fertilizers have significant effect on the plant height of okra (Table 2). Treatments 100-20, 100-40, 100-60, 100-90 kg ha<sup>-1</sup> showed that the mean plant height is 73.45, 79.55, 84.42 and 91.44 cm respectively, while in comparison control showed 62.78 cm (Table 2) [9] indicated that the nitrogen and phosphorus fertilizers at different levels significantly increased plant height of okra. The higher dose of N and P might increase cell division and formation of more tissues resulting in luxuriant vegetative growth and thereby increased plant height [10].

### Number of leaves plant<sup>-1</sup>

Results showed that NP fertilizers have significant effect on the number of leaves (Table 2). Treatments 100-20, 100-40, 100-60 and 100-90 showed 43.67, 27.67, 34.33 and 24.33 mean effect on leaves, respectively while the control showed only 20.67 [11]. Studied that nitrogen supply induced more leaves plant<sup>-1</sup>. The average leaves plant<sup>-1</sup> (22.8) were found to be maximum in the spacing S-20.

### Number of branches plant<sup>-1</sup>

Number of branches plant<sup>-1</sup> treatment 100-20, 100-40, 100-60 and 100-90 kg ha<sup>-1</sup> showed 6.66, 8.33, 5.33 and 4.33 mean effects respectively while the control only showed 2.33 (Table 2) [12]. Studied number of branches increased significantly in almost all the treatment from T<sub>0</sub> and increased slowly with increased in levels of fertilizer T1 to T4 and the highest values had in T4 respectively.

**Table 2:** Effect of different rates of NP fertilizers on the yield and yield components of okra.

Fertilizer (kg ha <sup>-1</sup> )	Yield (tha <sup>-1</sup> )	Plant height (cm)	Leaves plant <sup>-1</sup>	Branches plant <sup>-1</sup>	Days to flowering	Survival %age	Single pod weight (g)
0-0	6.62 e	62.78 e	20.67 e	2.33 e	64.33 a	52.85 e	9.73 c
100-20	8.86 c	73.45 d	43.67 a	6.66 b	55.66 b	88.24 a	5.43 e
100-40	11.85 a	79.55 c	27.67 c	8.33 c	44.33 c	75.04 b	7.90 d
100-60	10.25 b	84.42 b	34.33 b	5.33 c	48.00 c	67.46 c	11.78 d
100-90	8.07 d	91.44 a	24.33 d	4.33 d	66.33 a	60.37 d	13.53 a
LSD(P<0.05)	0.59	3.45	2.15	0.97	7.38	5.95	1.64

### Days to flowering

For flowering days of okra NP fertilizers have non-significant effect (Table 2). Different treatments combination revealed that the mean effect on days to flowering were 55.66, 44.33, 48.00 and 66.33, respectively while control showed 64.33 [12]. Also showed that days taken to first flowering marginally reduced with the application of nutrients either alone or in combination. However, these were failed to bring about statistically significant variation over control.

### Survival %age

NP fertilizers have significant effect on the survival %age of okra plant (Table 2). Treatment 100-20, 100-40, 100-60 and 100-90 kg ha<sup>-1</sup> showed the mean effect of 88.24, 75.04, 67.46 and 60.37 % respectively. Comparing control with different treatments which showed 52.85 %. Results indicated that the initial NP fertilizers rate is 100-20 which gave significantly higher survival %age than other treatment plots. The lower survival %age in the other fertilizer treatments might be due to excess of applied phosphorus in which the young plants could not survive better.

### Single pod weight

Results showed that treatments 100-20, 100-40, 100-60 and 100-90 kg ha<sup>-1</sup> have produced 5.43, 7.90, 11.78 and 13.53g on the pod weight, respectively while control only showed 9.73g single pod weight [12]. Nitrogen fertilizer at the rate of 100 kg N ha<sup>-1</sup> had significant effect on pod weight of okra.

### Conclusions and Recommendations

Among the varying combination of NP fertilizers, 100-40 kg ha<sup>-1</sup> showed overall good results on the yield and yield attributes of okra under the prevailing conditions of the Charsadda area. Therefore, NP fertilizers rate 100-40 kg ha<sup>-1</sup> is recommended to

get the maximum yield of okra under the prevailing conditions of Charsadda area.

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