



## RESEARCH PAPER

# To find out the suitable high yielding varieties of lentil for rainfed conditions of eastern Uttar Pradesh

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**Abstract :** The field experiment was conducted at Agronomy Research Farm of N.D.U.A. and T., Kumarganj, Faizabad during Rabi season of 2013-14 to study the performance of lentil varieties under rainfed condition in respect of growth and development, yield and yield contributing characters, quality and economics. Twelve varieties of lentil IPL-81, K-75, NDL-1, IPL-406, DPL-15, PL-5, PL-234, PL-4, DPL-62, PL-406, PL-63 and HUL-57 were tested in Randomized Block Design (RBD) with three replications. The soil of the experimental field was silty loam in texture, having pH 8.3, organic carbon 0.35 per cent, available nitrogen 175 kg ha<sup>-1</sup>, phosphorus 14.50 kg ha<sup>-1</sup>, potassium 248.50 kg ha<sup>-1</sup> and electrical conductivity 0.41 dSm<sup>-1</sup>. The performance of PL-406 variety of lentil was found significantly superior over rest of the varieties in respect of all growth, yield and yield contributing characters except plant height and test weight. The maximum plant height was recorded in IPL-406 variety while the higher test weight (g) was recorded in DPL-62 variety. The highest net return (Rs. 73743 ha<sup>-1</sup>) and B:C ratio (4.3) was obtained with PL-406 variety of lentil under the rainfed condition.

**Key Words :** Yield, Growth, High yielding varieties, Rainfed

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## INTRODUCTION

Pulses are very important source of protein in Indian diets as majority of population are vegetarian. Pulses are very nutritive leguminous crops that provide a high value protein. Lentil grains are used mostly as 'dal'. Its grain contains about 11 per cent water, 25 per cent protein and 60 per cent carbohydrate. It is also rich in calcium, iron and niacin. It plays a vital role in improving soil fertility and reserve natural resource which are essential for

sustainable agriculture (Mehta *et al.*, 2005). Recommend the per capita availability of pulses is 65g/day/capita (The Indian council of medical research in 2008). Whereas FAO/WHO recommendation of minimum requirement is 80g /day/person. In India Lentil occupies an area of 45.55 thousand hectare with a production of 37.35 thousand tonnes and productivity of 820 kg ha<sup>-1</sup> (FAOSTAT, 2012-2013). Lentil predominantly rainfed crop grown in constrained and limiting factor environment. Several causes are responsible for low yield of lentil of

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which the use of traditional local cultivars, low plant density unit<sup>-1</sup> area, weed infestation and poor crop management practices constitute the major ones. Use of the modern lentil cultivars and maintenance of proper plant density unit<sup>-1</sup> area would thus, help in increasing the yield from unit<sup>-1</sup> area. The development of high yielding varieties of lentil for the rainfed areas is one of the major concerns of the scientist because, the use of improved variety results in increase in productivity of any crop. Generally short duration varieties are more suitable for rainfed conditions. The use of improved varieties alone accounts for 20-25 per cent increase in productivity of lentil crop. The rainfed agriculture is characterized by limited availability of moisture. If the availability of moisture is not proper at the time of germination, the poor germination due to lack of moisture ultimately adversely affects the yield of crop. The moisture stored in rhizosphere of the soils of rainfed areas generally determines the crop growth. If the profile stored soil moisture is properly exploited by judicious management practices, then good crop yield may be expected from rainfed areas also for the efficient utilization of stored soil moisture under rainfed conditions. The present investigation was carried out to study the performance of lentil (*Lens culinaris* M.) varieties under rainfed conditions.

## MATERIAL AND METHODS

A field experiment was conducted during *Rabi* season of 2013-2014 at Agronomy Research Farm of NDUAT, Faizabad. There were 12 treatments which were laid out in Randomized Block Design with three replications, net plot size was 2.40m × 4.40m with 30cm row spacing, respectively. Soil of the experimental field was silt loam in texture with electrical conductivity 0.33dSm<sup>-1</sup> slightly alkaline in reaction with 7.9pH low in organic carbon (0.32%), low in available nitrogen (108.4 kg ha<sup>-1</sup>), phosphorus (18.4 kg ha<sup>-1</sup>), medium in potassium (290 kg ha<sup>-1</sup>), available sulphur 7.3 (ppm) and available zinc 0.59(ppm). The crop was sown on 20 November 2013 and harvested on 6 April 2014. Data on growth, yield, protein content. were recorded as per standard procedures. Economics of the different treatments was also computed as per standard procedures.

## RESULTS AND DISCUSSION

The findings of the present study as well as relevant

Table 1 : To study the performance of lentil (*Lens culinaris* Medik) varieties under rainfed conditions

| Treatments    | Varieties | Number of pod plant <sup>-1</sup> | Number of grains Pod <sup>-1</sup> | 1000-seed weight (g) | Grain yield (kg plot <sup>-1</sup> ) | Grain yield (q ha <sup>-1</sup> ) | Straw yield (q ha <sup>-1</sup> ) | Harvest index (%) | Nitrogen content in grain (%) | Nitrogen content in straw (%) | Protein content in grain (%) | Nitrogen uptake (kg ha <sup>-1</sup> ) by |       | Total nitrogen uptake (kg ha <sup>-1</sup> ) | Phosphorus uptake (kg ha <sup>-1</sup> ) by |       | Total phosphorus uptake (kg ha <sup>-1</sup> ) |
|---------------|-----------|-----------------------------------|------------------------------------|----------------------|--------------------------------------|-----------------------------------|-----------------------------------|-------------------|-------------------------------|-------------------------------|------------------------------|-------------------------------------------|-------|----------------------------------------------|---------------------------------------------|-------|------------------------------------------------|
|               |           |                                   |                                    |                      |                                      |                                   |                                   |                   |                               |                               |                              | Grain                                     | Straw |                                              | Grain                                       | Straw |                                                |
| IPL-81        |           | 87.15                             | 1.33                               | 24.20                | 0.90                                 | 8.50                              | 10.65                             | 44.30             | 3.95                          | 1.52                          | 24.69                        | 33.56                                     | 16.17 | 49.73                                        | 2.29                                        | 0.61  | 2.90                                           |
| K-75          |           | 112.00                            | 1.67                               | 19.70                | 1.27                                 | 12.00                             | 15.28                             | 43.93             | 3.97                          | 1.50                          | 24.81                        | 47.62                                     | 22.87 | 70.49                                        | 2.88                                        | 0.52  | 3.80                                           |
| NDL-1         |           | 140.00                            | 2.00                               | 17.10                | 1.70                                 | 16.07                             | 20.24                             | 44.29             | 3.95                          | 1.53                          | 24.69                        | 63.57                                     | 30.95 | 94.52                                        | 4.02                                        | 1.17  | 5.19                                           |
| IPL-406       |           | 133.35                            | 1.00                               | 23.50                | 1.60                                 | 15.12                             | 18.59                             | 44.90             | 3.94                          | 1.48                          | 24.63                        | 59.64                                     | 27.57 | 87.21                                        | 3.94                                        | 1.14  | 5.07                                           |
| DPL-15        |           | 119.70                            | 1.33                               | 28.30                | 1.39                                 | 13.14                             | 16.43                             | 45.37             | 3.95                          | 1.52                          | 24.69                        | 51.88                                     | 24.99 | 76.87                                        | 3.02                                        | 0.59  | 4.01                                           |
| PL-5          |           | 118.30                            | 1.33                               | 22.10                | 1.37                                 | 12.95                             | 15.66                             | 45.21             | 3.97                          | 1.55                          | 24.81                        | 51.35                                     | 24.30 | 75.65                                        | 3.88                                        | 0.59  | 4.87                                           |
| PL-234        |           | 122.15                            | 1.67                               | 27.50                | 1.43                                 | 13.51                             | 17.10                             | 44.11             | 3.90                          | 1.53                          | 24.38                        | 52.90                                     | 26.11 | 79.02                                        | 3.80                                        | 1.06  | 4.86                                           |
| PL-4          |           | 128.80                            | 1.67                               | 18.10                | 1.53                                 | 14.45                             | 18.40                             | 43.89             | 3.92                          | 1.50                          | 24.50                        | 56.53                                     | 27.59 | 84.12                                        | 4.18                                        | 1.05  | 5.23                                           |
| DPL-62        |           | 116.20                            | 1.33                               | 30.50                | 1.34                                 | 12.65                             | 15.72                             | 44.60             | 3.97                          | 1.54                          | 24.81                        | 50.20                                     | 24.18 | 74.38                                        | 3.41                                        | 0.56  | 4.37                                           |
| PL-406        |           | 145.25                            | 1.67                               | 19.90                | 1.78                                 | 16.83                             | 20.54                             | 45.06             | 3.98                          | 1.52                          | 24.88                        | 66.86                                     | 31.28 | 98.14                                        | 5.21                                        | 1.32  | 6.52                                           |
| PL-63         |           | 94.50                             | 2.00                               | 22.50                | 1.01                                 | 9.55                              | 11.83                             | 44.73             | 3.95                          | 1.55                          | 24.69                        | 37.70                                     | 18.39 | 56.09                                        | 2.77                                        | 0.72  | 3.49                                           |
| HUL-57        |           | 103.25                            | 1.67                               | 19.30                | 1.04                                 | 10.77                             | 13.27                             | 44.82             | 3.93                          | 1.54                          | 24.56                        | 42.38                                     | 20.49 | 62.87                                        | 2.81                                        | 0.84  | 3.65                                           |
| S.E.±         |           | 5.40                              | 0.06                               | 1.12                 | 0.07                                 | 0.71                              | 0.69                              | 1.72              | 0.10                          | 0.04                          | 0.67                         | 3.13                                      | 1.33  | 3.28                                         | 0.21                                        | 0.05  | 0.23                                           |
| C.D. (P=0.05) |           | 15.84                             | 0.17                               | 3.21                 | 0.22                                 | 2.08                              | 2.02                              | NS                | NS                            | NS                            | NS                           | 9.20                                      | 3.92  | 9.64                                         | 0.63                                        | 0.16  | 0.68                                           |

NS=Non-significant

discussion have been presented under following heads :

### Yield contributing characters :

The maximum number of pods plant<sup>-1</sup> (145.25) was recorded in the variety PL-406 followed by variety NDL-1 (140) and IPL-406 (133.35) which was significantly superior over rest varieties. Minimum number of pods plant<sup>-1</sup> (87.15) was recorded in variety IPL-81 (Table 1).

The maximum number of grains pod<sup>-1</sup> was recorded with NDL-1 and PL-63 followed by variety K-75, PL-234, PL-4, PL-406 and HUL-57 (1.67). There was significant difference in varietal performance for number of grains pod<sup>-1</sup> over IPL-81, DPL-15, PL-5 and DPL-62. Closely results were found by Shukla *et al.* (2001) and Singh *et al.* (2002).

The test weight varied from 17.1g to 30.5g. Maximum test weight of 30.5g was recorded with variety DPL-62 followed by DPL-15 (28.3g) and PL-234 (27.5g). They were significantly superior over rest of the other varieties. Singh and Gupta (2005) also reported the similar results.

The variety PL-406 produced more grain yield per plot (1.78 kg plot<sup>-1</sup>) and it was significantly superior over rest of the varieties. The lowest grain yield (0.90 kg plot<sup>-1</sup>) was recorded of the variety IPL-81. The maximum grain yield was recorded from PL-406 (16.83 q ha<sup>-1</sup>) followed by NDL-1 IPL-406 and significantly superior over rest of the varieties. The lowest grain yield was observed with the variety IPL-81 (8.50 q ha<sup>-1</sup>). Closely results were also found by Lal *et al.* (1985) and Singh and Gupta (2005).

The maximum straw yield was recorded (20.54 q ha<sup>-1</sup>) in the variety PL-406 which was significantly

superior over rest of the varieties and at par with NDL-1 and IPL-406 variety. The lowest straw yield was recorded (10.65 q ha<sup>-1</sup>) with the variety IPL-81. Similar findings were reported by Singh *et al.* (1996) and Rai *et al.* (1997).

The maximum value of harvest index was recorded with the variety DPL-15 followed by PL-5 and PL-406 and higher over rest of the varieties. While the minimum value of harvest index was found in PL-4. Rai *et al.* (1997) also reported the similar results.

### Uptake studies :

The maximum nitrogen and protein content was recorded with variety PL-406 followed by variety K-75, PL-5 and DPL-62. The lowest value of nitrogen and protein content was recorded with variety PL-234 followed by PL-4. Closely result were also found by Singh and Singh (1990) and Tomer *et al.* (2007).

The maximum nitrogen uptake by crop was found (98.14 kg ha<sup>-1</sup>) with the variety PL-406, followed by NDL-1 (94.52 kg ha<sup>-1</sup>) and it was significantly superior as compared to rest of the varieties. The lowest nitrogen uptake (49.73 kg ha<sup>-1</sup>) by crop obtained in the variety IPL-81.

The variety PL-406 recorded the higher phosphorus uptake by crop which was significantly superior over rest of the varieties. The lowest phosphorus uptake by crop was recorded of the variety IPL-81. Balyan and Singh (2005) also reported the similar results.

### Economics :

The cost of cultivation recorded for all the varieties was same. The cost of cultivation of Rs. 16854 ha<sup>-1</sup> was calculated for all the varieties. The highest gross return

**Table 2 : To study the performance of lentil (*Lens culinaris*. Medik) varieties under rainfed conditions**

| Varieties | Cost of cultivation (Rs. ha <sup>-1</sup> ) | Gross income (Rs. ha <sup>-1</sup> ) | Net return (Rs. ha <sup>-1</sup> ) | Benefit - cost ratio |
|-----------|---------------------------------------------|--------------------------------------|------------------------------------|----------------------|
| IPL-81    | 16854                                       | 45797                                | 28952                              | 1.7                  |
| K-75      | 16854                                       | 66692                                | 49838                              | 2.9                  |
| NDL-1     | 16854                                       | 86600                                | 69746                              | 4.1                  |
| IPL-406   | 16854                                       | 81412                                | 64558                              | 3.8                  |
| DPL-15    | 16854                                       | 70792                                | 53938                              | 3.2                  |
| PL-5      | 16854                                       | 69689                                | 52835                              | 3.1                  |
| PL-234    | 16854                                       | 72817                                | 55693                              | 3.3                  |
| PL-4      | 16854                                       | 77952                                | 61098                              | 3.6                  |
| DPL-62    | 16854                                       | 68190                                | 51336                              | 3.0                  |
| PL-406    | 16854                                       | 90597                                | 73743                              | 4.3                  |
| PL-63     | 16854                                       | 51434                                | 34580                              | 2.0                  |
| HUL-57    | 16854                                       | 57994                                | 41140                              | 2.4                  |

of Rs. 90597 ha<sup>-1</sup> was obtained with PL-406 variety of lentil. It might be due to more yields of seed and straw of this variety. The maximum benefit- cost ratio of 4.3 was also recorded with the same variety. This is due to the increased net return in corresponding to the cost of cultivation (Table 2).

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