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# Effects of sowing windows on gradewise yield of tubers of potato

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**Abstract**
The field trial was conducted during both the seasons (2009-10 and 2010-11) on PGI Farm without changing randomization. The experiment was laid out in *rabi* season. The various components of yield and yield contributing characters were calculated. The growth and yield contributing characters, small (19.28 and 16.99 q $ha^{-1}$), medium (123.94 and 50.97 q $ha^{-1}$), large sized (132.20 and 271.81 q $ha^{-1}$), pooled yield (307.59 q $ha^{-1}$) and pooled haulm yield (12.23 q $ha^{-1}$) were higher in 1.2 IW/CPE ratio (5 irrigations at 18 to 20 days interval) and planting on 44th MW (Oct 29-Nov 04) with sugarcane trash mulch as compared to other treatments.

**Keywords:** Sowing window, grade wise yield of tuber, small, medium and large

## Introduction
Potato is one of the most important crops of the world, ranking next to rice and wheat. In the world more than billion people eat potatoes (Rajendra Prasad, 2002) [2]. The potato is a crop which always been the poor man's friend. For vegetable purpose, it has become one of the most popular crops in the country. Potatoes are economical food as they provide a source of low cost energy to human diet. Potato is one of the world leading vegetable crops and cheapest source of carbohydrate and furnishes appreciable amount of vitamin $B_1$ and $C_1$ as well as minerals (Thompson and Kelly 1972) [3]. They contain 20.6 per cent carbohydrate, 0.3 per cent fat, 1 per cent crude fibre and 0.9 per cent ash. They also contain a good amount of essential amino acids like leucine, tryptophan and isoleucine (Anonymous, 2008) [1]. The non-adoption of improved agro-techniques in a climate change scenario as irrigation scheduling, variable planting dates and use of mulch are the limiting factors for low productivity and poor in creation of favorable microclimatic conditions. Globally this climate change should also be addressed in eco-friendly manner.
With this back ground in view, the present investigation was undertaken to know the gradewise yield of tuber as Influenced by sowing windows in potato.

## Materials and Methods
The field trial of Potato (Variety) Kufri Pukhraj was conducted during both the seasons (2009-10 and 2010-11) on PGI Farm without changing randomization. The experiment was laid out Split Plot Design in rabi season with Recommended dose of fertilizer. 120:60:120 NPK Kg $ha^{-1}$. There were eighteen treatments comprised of nine main plot treatments and two sub-plot treatments.

| **Treatment details: A. Main plot Treatments (Nine)** | |
|---|---|
| **Irrigation levels (I) X Planting dates (D)** | |
| $I_1D_1$ - (0.8 IW/CPE) X (42 MW) | $I_2D_1$ - (1.0 IW/CPE) X (42 MW) |
| $I_1D_2$ - (0.8 IW/CPE) X (44 MW) | $I_2D_2$ - (1.0 IW/CPE) X (44 MW) |
| $I_1D_3$ - (0.8 IW/CPE) X (46 MW) | $I_2D_3$ - (1.0 IW/CPE) X (46 MW) |
| $I_3D_1$ - (1.2 IW/CPE) X (42 MW) | |
| $I_3D_2$ - (1.2 IW/CPE) X (44 MW) | |
| $I_3D_3$ - (1.2 IW/CPE) X (46 MW) | |
| **B. Sub-plot Treatments (Two) Mulching (M)** | |
| M1 - With mulch | M2 - Without mulch |

**Post-harvest studies**
The sample plants which selected earlier for pre harvest studies of potato crop were used later for post-harvest studies too.

**Harvesting of tubers**
Before harvesting of tubers dehaulming was done and haulms were put on the ridges for drying and tubers were kept in soil for five days for hardening of tuber skin. Harvesting of potato tubers was done manually according to the planting dates. The ring lines were first harvested and then tubers from net area were harvested and weighed separately gradewise from each net plot.

**Results and Discussions**
The important findings of the experiment studies under different irrigation levels, planting dates and mulching are presented in this chapter under appropriate heads.

**Gradewise yield of tubers**
The data regarding gradewise yield of tubers (q $ha^{-1}$) as influenced by various treatments during 2009-10, 2010-11 and total are presented in Table 1 and 2 and graphically depicted in Fig. 1 The mean yield of small grades (< 25 g), medium (25-75 g) and big (>75 g) was, 15.31, 98.40 and 104.96 q $ha^{-1}$ during and it was 11.95, 35.84 and 191.14 a $ha^{-1}$ during second year.

**Effect of irrigation levels and planting dates (I x D)**
The irrigation levels and planting dates significantly influenced the gradewise yield of potato tubers during both the years.

**Small grade (<25 g)**
During first year, the treatment $I_3D_2$ was significantly obtained the highest yield of small grade tubers (19.28 q $ha^{-1}$) followed by $I_3D_1$ (18.09 q $ha^{-1}$), which was at par with $I_2D_2$ followed by $I_3D_3$ and $I_2D_1$.The treatment $I_2D_1$, $I_1D_2$ and $I_2D_3$ were at par with each other. The lowest yield was obtained in $I_1D_1$ (11.09 q $ha^{-1}$). During second year, the treatment $I_3D_2$ was significantly obtained the highest yield of small grade tubers (16.99 q $ha^{-1}$) followed by $I_2D_2$ (14.78 q $ha^{-1}$), $I_3D_3$, $I_3D_1$ and $I_1D_2$. The treatment $I_1D_2$ and $I_2D_1$ were at par with each other. The lowest yield was obtained in $I_1D_1$ (8.53 q $ha^{-1}$).

**Medium grade (25-75 g)**
During first year, the treatment $I_3D_2$ was significantly obtained the highest yield of medium grade tubers (123.94 q $ha^{-1}$) followed by $I_3D_1$, which was at par with $I_2D_2$ (115.06 q $ha^{-1}$) followed by $I_3D_3$ and $I_2D_1$. The treatment $I_2D_1$ was at par with $I_1D_2$ and $I_2D_3$. The lowest yield was obtained in $I_1D_1$ (71.27 q $ha^{-1}$). During second year, the treatment $I_3D_2$ was significantly obtained the highest yield of medium grade tubers (50.97 q $ha^{-1}$) which was followed by $I_2D_2$ (44.34 q $ha^{-1}$), $I_3D_3$, $I_3D_1$ and $I_1D_2$. The treatment $I_1D_2$ was at par with $I_2D_1$ followed by $I_2D_3$. The lowest yield was obtained in $I_1D_1$ (25.60 q $ha^{-1}$).

**Large grade (>75 g)**
During first year, the treatment $I_3D_2$ was significantly obtained the highest yield of large grade tubers (132.20 q $ha^{-1}$) followed by $I_3D_1$ (124.05 q $ha^{-1}$), which was at par with $I_2D_2$ followed by $I_3D_3$ $I_2D_1$. The lowest yield was obtained in $I_1D_1$ (76.03 q $ha^{-1}$). During second year, the treatment $I_3D_2$ was significantly obtained the highest yield of medium grade of tubers (271.81 q $ha^{-1}$) followed by $I_2D_2$ (236.48 q $ha^{-1}$), $I_3D_3$, $I_3D_1$ and $I_1D_2$. The treatment $I_1D_2$ was at par with $I_2D_1$. The lowest yield was obtained in $I_1D_1$ (136.51 q $ha^{-1}$).

**Effect of mulching**
In mulching, gradewise yield of tuber was significantly superior to without mulching during both years.

**Interactions**
The data presented in Table 1 indicate that, during first year, interaction effect of irrigation levels with mulching and planting dates with mulching were non-significant, while during second year they were found significant.

**Interaction effect between (IxM)**
During second year, the interaction combination of different treatments, $I_3M_1$ was recorded significantly the highest yield of small grade tubers (15.01 q $ha^{-1}$) (Table 1) medium grade tubers (45.04 q $ha^{-1}$) and large tuber yield (240.21 q $ha^{-1}$) (Table 2) which were followed by $I_3M_2$, significantly superior to rest of the treatments. The treatment combination $I_3M_2$ and $I_2M_1$ were at par with each other's. The treatments $I_2M_2$, $I_1M_2$ and $I_1M_2$ were recording the yield in descending order.

**Interaction effect between (DxM)**
During second year, the interaction combination of different treatments, $D_2M_1$ was recorded significantly the highest small grade tubers (15.34 q $ha^{-1}$), medium grade tubers (46.02 q $ha^{-1}$) and large tuber yield (245.44 q $ha^{-1}$) (Table 1). Which were followed by $D_2M_2$ and $D_3M_1$. The treatments $D_1M_1$, $D_1M_2$ and $D_3M_2$ were yielding in descending order.

**Table 1:** Yield contributing characters of potato as influenced by different treatments at harvest

| Treatments | Tuber yield (q $ha^{-1}$) (2009-10) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Small (up to 25 g) | | | Medium (25-75 g) | | | Large (>75 g) | | | Total | | |
| | $M_1$ | $M_2$ | Mean | $M_1$ | $M_2$ | mean | $M_1$ | $M_2$ | mean | $M_1$ | $M_2$ | mean |
| $I_1D_1$ | 12.55 | 11.79 | 12.17 | 80.67 | 72.86 | 76.76 | 86.05 | 80.82 | 83.43 | 179.27 | 168.46 | 173.87 |
| $I_1D_2$ | 13.37 | 12.42 | 12.90 | 85.96 | 79.86 | 82.91 | 91.69 | 85.19 | 88.44 | 191.02 | 177.48 | 184.25 |
| $I_1D_3$ | 10.56 | 10.37 | 10.46 | 67.87 | 52.64 | 60.25 | 72.39 | 71.09 | 71.74 | 150.82 | 134.10 | 142.46 |
| $I_2D_1$ | 12.97 | 11.95 | 12.46 | 83.35 | 75.77 | 79.56 | 88.91 | 81.94 | 85.42 | 185.23 | 169.65 | 177.44 |
| $I_2D_2$ | 17.67 | 13.34 | 15.50 | 113.56 | 85.77 | 99.67 | 121.13 | 91.49 | 106.31 | 252.36 | 190.60 | 221.48 |
| $I_2D_3$ | 12.22 | 10.88 | 11.55 | 78.54 | 66.65 | 72.59 | 83.77 | 74.60 | 79.18 | 174.52 | 152.12 | 163.32 |
| $I_3D_1$ | 13.07 | 12.25 | 12.66 | 84.02 | 78.75 | 81.38 | 89.62 | 84.00 | 86.81 | 186.70 | 175.00 | 180.85 |
| $I_3D_2$ | 18.61 | 13.35 | 15.98 | 119.61 | 85.79 | 102.70 | 127.58 | 91.51 | 109.55 | 265.80 | 190.65 | 228.22 |
| $I_3D_3$ | 12.54 | 11.33 | 11.94 | 80.59 | 69.93 | 75.26 | 85.97 | 77.71 | 81.84 | 179.10 | 158.98 | 169.04 |
| mean | 13.73 | 11.96 | 12.85 | 88.24 | 74.22 | 81.23 | 94.12 | 82.04 | 88.08 | 196.09 | 168.56 | 182.33 |

| | S.Em± | CD at 5% | S.Em± | CD at 5% | S.Em± | CD at 5% | S.Em± | CD at 5% |
|---|---|---|---|---|---|---|---|---|
| Main plot (I X D) | 0.56 | 1.69 | 5.73 | 17.17 | 3.87 | 11.60 | 8.06 | 24.17 |
| Sub plot (M) | 0.36 | 1.07 | 2.92 | 8.67 | 2.46 | 7.31 | 5.12 | 15.23 |
| **Interactions** | | | | | | | | |
| I X M | 0.62 | NS | 5.06 | NS | 4.26 | 12.66 | 8.88 | 26.37 |
| D X M | 0.62 | NS | 5.06 | NS | 4.26 | 12.66 | 8.88 | 26.37 |
| (I X D) X M | 1.08 | 3.20 | 8.76 | NS | 7.38 | 21.92 | 15.37 | 45.68 |

**Note:** $I_1$-(0.8 IW/CPE), $I_2$-(1.0 IW/CPE), $I_3$-(1.2 IW/CPE), $D_1$-(42 MW), $D_2$-(44 MW), $D_3$-(46 MW), $M_1$- (with mulch), $M_2$- (without mulch)

**Interaction effect between (IxDxM)**

Perusal of the data Table 2 show that, during first year regarding small, medium and large grade tuber yield, the treatment combination $I_3D_2M_1$ was significantly superior contributing the highest gradewise yield of tubers (20.77, 133.54 and 142.44 q $ha^{-1}$) followed by $I_3D_1M_1$ (19.20, 123.44 and 131.67 q $ha^{-1}$), $I_2D_2M_1$ and $I_3D_2M_2$, while rest of the treatments were at par with each other's. Significantly the lowest tuber yield was obtained by $I_1D_1M_2$ in all cases.

During second year Table 2 also showed that, regarding small, medium and large grade tuber yield, the treatments combination $I_3D_2M_1$ was significantly superior contributing the highest gradewise yield of tubers (18.06, 54.18 and 288.96 q $ha^{-1}$) followed by $I_3D_2M_2$, $I_2D_2M_1$ and $I_2D_2M_2$, while rest of the treatments were at par with each other's. Significantly the lowest tuber yield was obtained by $I_1D_3M_2$ in all cases.

**Table 2:** Gradewise yield of tubers as influenced by different treatments 2010-11

| Treatments | Tuber yield (q $ha^{-1}$) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Small (up to 25 g) | | | Medium (25-75 g) | | | Large (>75 g) | | | Total | | |
| | $M_1$ (With mulch) | $M_2$ (Without mulch) | Mean | $M_1$ (With mulch) | $M_2$ (Without mulch) | Mean | $M_1$ (With mulch) | $M_2$ (Without mulch) | Mean | $M_1$ (With mulch) | $M_2$ (Without mulch) | Mean |
| $I_1D_1$ (0.8 IW/CPE x 42 MW) | 8.98 | 8.08 | 8.53 | 26.94 | 24.25 | 25.60 | 143.68 | 129.34 | 136.51 | 179.60 | 161.67 | 170.64 |
| $I_1D_2$ (0.8 IW/CPE x 44 MW) | 12.25 | 10.82 | 11.54 | 36.75 | 32.47 | 34.61 | 196.01 | 173.16 | 184.58 | 245.01 | 216.44 | 230.73 |
| $I_1D_3$ (0.8 IW/CPE x 46 MW) | 9.30 | 8.07 | 8.69 | 27.90 | 24.22 | 26.06 | 148.80 | 129.16 | 138.98 | 186.00 | 161.44 | 173.72 |
| $I_2D_1$ (1.0 IW/CPE x 42 MW) | 12.10 | 10.52 | 11.31 | 36.31 | 31.57 | 33.94 | 193.66 | 168.36 | 181.01 | 242.08 | 210.44 | 226.26 |
| $I_2D_2$ (1.0 IW/CPE x 44 MW) | 15.71 | 13.85 | 14.78 | 47.13 | 41.55 | 44.34 | 251.35 | 221.60 | 236.48 | 314.19 | 277.00 | 295.60 |
| $I_2D_3$ (1.0 IW/CPE x 46 MW) | 11.60 | 8.81 | 10.20 | 34.80 | 26.42 | 30.61 | 185.60 | 140.89 | 163.25 | 232.01 | 176.11 | 204.06 |
| $I_3D_1$ (1.2 IW/CPE x 42 MW) | 13.21 | 11.71 | 12.46 | 39.64 | 35.13 | 37.38 | 211.39 | 187.33 | 199.36 | 264.23 | 234.17 | 249.20 |
| $I_3D_2$ (1.2 IW/CPE x 44 MW) | 18.06 | 15.92 | 16.99 | 54.18 | 47.75 | 50.97 | 288.96 | 254.67 | 271.81 | 361.20 | 318.33 | 339.77 |
| $I_3D_3$ (1.2 IW/CPE x 46 MW) | 13.77 | 12.27 | 13.02 | 41.30 | 36.82 | 39.06 | 220.29 | 196.35 | 208.32 | 275.37 | 245.44 | 260.40 |
| Mean | 12.78 | 11.12 | 11.95 | 38.33 | 33.35 | 35.84 | 204.42 | 177.87 | 191.14 | 255.52 | 222.34 | 238.93 |
| | S.Em± | CD at 5% | | S.Em± | CD at 5% | | S.Em± | CD at 5% | | S.Em± | CD at 5% | |
| Main plot(I X D) | 0.13 | 0.38 | | 0.38 | 1.13 | | 2.01 | 6.03 | | 2.51 | 7.54 | |
| Sub plot (M) | 0.06 | 0.17 | | 0.17 | 0.52 | | 0.93 | 2.76 | | 1.16 | 3.45 | |
| **Interactions** | | | | | | | | | | | | |
| I X M | 0.10 | 0.30 | | 0.30 | 0.90 | | 1.61 | 4.77 | | 2.01 | 5.97 | |
| D X M | 0.10 | 0.30 | | 0.30 | 0.90 | | 1.61 | 4.77 | | 2.01 | 5.97 | |
| (I X D) X M | 0.17 | 0.52 | | 0.52 | 1.55 | | 2.78 | 8.27 | | 3.48 | 10.34 | |

**Table 3:** Interaction effect of irrigation levels and planting dates with mulching on gradewise yield of potato during 2010-11

| Small (up to 25 g) (q $ha^{-1}$) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Irrigation levels** | **$M_1$ (With mulch)** | **$M_2$ (Without mulch)** | **Mean** | **Planting dates** | **$M_1$ (With mulch)** | **$M_2$ (Without mulch)** | **Mean** |
| $I_1$ (0.8 IW/CPE) | 10.18 | 8.99 | 9.58 | $D_1$ (42 MW) | 11.43 | 10.10 | 10.77 |
| $I_2$ (1.0 IW/CPE) | 13.14 | 11.06 | 12.10 | $D_2$ (44 MW) | 15.34 | 13.53 | 14.43 |
| $I_3$ (1.2 IW/CPE) | 15.01 | 13.30 | 14.16 | $D_3$ (46 MW) | 11.56 | 9.72 | 10.64 |
| Mean | 12.78 | 11.12 | 11.95 | Mean | 12.78 | 11.12 | 11.95 |
| S.Em± | 0.10 | | | S.Em± | 0.10 | | |
| CD at 5% | 0.30 | | | CD at 5% | 0.30 | | |
| **Medium (25-75 g) (q $ha^{-1}$)** | | | | | | | |
| **Irrigation levels** | **$M_1$ (With mulch)** | **$M_2$ (Without mulch)** | **Mean** | **Planting dates** | **$M_1$ (With mulch)** | **$M_2$ (Without mulch)** | **Mean** |
| $I_1$ (0.8 IW/CPE) | 30.53 | 26.98 | 28.75 | $D_1$ (42 MW) | 34.30 | 30.31 | 32.30 |
| $I_2$ (1.0 IW/CPE) | 39.41 | 33.18 | 36.30 | $D_2$ (44 MW) | 46.02 | 40.59 | 43.30 |
| $I_3$ (1.2 IW/CPE) | 45.04 | 39.90 | 42.47 | $D_3$ (46 MW) | 34.67 | 29.15 | 31.91 |
| Mean | 38.33 | 33.35 | 35.84 | Mean | 38.33 | 33.35 | 35.84 |
| S.Em± | 0.30 | | | S.Em± | 0.30 | | |
| CD at 5% | 0.90 | | | CD at 5% | 0.90 | | |
| **Large (>75 g) (q $ha^{-1}$)** | | | | | | | |
| **Irrigation levels** | **$M_1$ (With mulch)** | **$M_2$ (Without mulch)** | **Mean** | **Planting dates** | **$M_1$ (With mulch)** | **$M_2$ (Without mulch)** | **Mean** |
| $I_1$ (0.8 IW/CPE) | 162.83 | 143.88 | 153.36 | $D_1$ (42 MW) | 182.91 | 161.68 | 172.29 |
| $I_2$ (1.0 IW/CPE) | 210.21 | 176.95 | 193.58 | $D_2$ (44 MW) | 245.44 | 216.47 | 230.96 |
| $I_3$ (1.2 IW/CPE) | 240.21 | 212.78 | 226.50 | $D_3$ (46 MW) | 184.90 | 155.47 | 170.18 |
| Mean | 204.42 | 177.87 | 191.14 | Mean | 204.42 | 177.87 | 191.14 |

| | | | | | |
|---|---|---|---|---|---|
| S.Em± | 1.61 | | S.Em± | 1.61 | |
| CD at 5% | 4.77 | | CD at 5% | 4.77 | |

**Conclusion**

The interaction between main plot treatments (IxD) with sub plot treatment (M) *i.e.* (IxDxM) were significant for all the yield contributing characters *viz.*, small, large size tuber, total tuber yield and haulm yield in which the irrigation applied at 1.2 IW/CPE ratio and early planting on 44$^{th}$ MW with sugarcane trash mulching ($I_3D_2M_1$) recorded higher values for all the yield contributing characters.

**References**

1. Anonymous; c2008. www.fao.org
2. Rajendra Prasad. Field crop production commercial crops, Indian Council of Agriculture Research, New Delhi; c2002. p. 2.
3. Thompson HE, Kelly WC. Vegetable crops (5$^{th}$ edition) McGraw- Hill Book Co. New York; c1972. p. 372.