Effect of different dates of planting and various mulchingpractices on growth, yield attributes and yield of potato

ABSTRACT

Thepresent research work was conducted at Pili kothi farm, Department of Agronomy, TilakDhari Post Graduate College, Jaunpur, Uttar Pradesh during winter season of 2018 and 2019. The experiment was laid out in Factorial Randomized Block Design. The treatments comprised of different planting dates viz.20 days early planting on 17th October, 10 days early planting on 27th October, Optimum planting time on 7th November, 10 days late planting on 17th November and 20 days late planting on 27th November and different mulching practices viz.Organic mulch (Paddy straw at 5 t/ha), Plastic mulch (Black colour)and Control (Without mulch)of potato. There were 15 treatments and each were replicated to fourfolds. These treatments were randomly arranged in each replication and divided into sixty plots.The results revealed that the significantly maximumemergence percentage 30 DAP (92.70, 94.30 and 93.50), Plant height (cm) at 45 DAP (40.40 cm,42.20cm and 41.30 cm), Numbers of compound leaves/hill at 45 DAP (57.10, 57.40 and 57.30), Number of tubers/plot (603.80,640.00and 621.90), Weight of tubers/plot (kg) (37.20 ,37.80 and 37.50) and Number of tubers/plant(10.10,10.70 and 10.40)were recorded under20 Days Early Planting On 17th October among different planting dates during first, second and mean data also. Whereas among the mulching practices significant variation were recorded among the all parameter except number of compound leaves. However maximum emergence percentage 30 DAP (90.20, 91.60 and 90.90), Plant height (cm) at 45 DAP (35.70 cm,37.50 cm and 36.60 cm),Numbers of compound leaves/hill at 45 DAP(53.70,54.20 and 53.90), Number of tubers/plot (513.00, 552.80 and 532.90), Weight of tubers/plot (kg) (34.10,34.60 and 34.30) and Number of tubers/plant(8.60,9.20 and 8.90) under the organic mulch (paddy straw at 5 t/ha) respectively, during first, second as well as in mean data also.

Keywords : Dates of planting, Mulching, Potato.

INTRODUCTION

Potato (*Solanum tuberosum*L.) popularly known as “The King of Vegetables” is a native of South America and occupies the largest area under any single vegetable crop in the world. Presently, developing countries of Asia accounts for more than 46% of global output. This spectacular growth in developing countries affirms its increasing importance as a source of food for growing populations, rural employment and income generation. Potato is an

important food crop at global as well as the country level. Potato is a rich source of protein, least 12 essential vitamins such as (vitamin C, thiamine and folic acid), minerals and superior dietary fibre etc. It is an excellent source of carbohydrates with low fat contents which makes it a balance food. Due to high protein: calorie ratio (17g protein: 1000 kcal) and short vegetative cycle, potatoes yield substantially more edible energy, protein and dry matter per unit area per unit time. Planting time plays a very important role in potato production as manipulation of light and temperature can be done to a certain extent by altering planting time **(Thongam*et al.* 2017)**. Mulching of potato crop with organic waste increases potato tuber yield owing to better soil and plant water status and more roots **(Satapathy *et al.* 2016).**Mulching is an agrotechnical technique that directly determines the microclimate of plants in several ways. It reduces evaporation warms the surface soil layer after sowing increasing the microbiological activity **(**Bijeta and Raghav, 2019). By considering above points in mind present investigation was conducted to identify suitable planting date of potato with mulching for higher productivity

MATERIALS METHODS

A field experiment entitled, "Effect of different dates of planting and various mulching practices on growth, yield attributes and yield of potato" was carried out at Pili kothi farm, Department of Agronomy, TilakDhari Post Graduate College, Jaunpur, Uttar Pradesh Situated at 25.73^{o} N latitude, 82.68^{o} E longitude and at an altitude of 82 m above mean sea level. During winter season of 2018 and 2019. A total rainfall of 29.4 mm and 54.9 mm was received during the experimentation period in 2018 and 2019, where 5.0 and 6.0 days are rainy days, respectively. The amount of rainfall was comparatively higher (54.9 mm) in the second year. The experiment was laid out in Factorial Randomized Block Design. The treatments comprised of different planting dates viz.20 days early planting on 17th October, 10 days early planting on 27th October, Optimum planting time on 7th November, 10 days late planting on 17th Novemberand 20 days late planting on 27th Novemberand different mulching practices viz.Organic mulch (Paddy straw at 5 t/ha), Plastic mulch (Black colour)and Control (Without mulch)of potato. There were 15 treatments and each were replicated to fourfolds. These treatments were randomly arranged in each replication and divided into sixty plots.The pre-sowing irrigation was done after the harvest of the preceding crop. The whole experimental field was irrigated and left for four days. So that the rhizosphere attain moisture and good soil structure. Later on, primary tillage was done through tractor drawn disc plough in the whole experimental field for proper aeration**.** Secondary tillage was done through tractor drawn disc harrow and planker which helps in breaking the clods and levelling the land for proper seedbed. Previous crop residues or stubbles and weeds were removed with the help of rake and also partial work done manually by hand. The fertilizer inputs used are urea as a source of nitrogen, diammonium phosphate (DAP) as a source of phosphorus, muriate of potash (MOP) as a source of potassium. 120 kg N, 60 kg P_2O_5 and 80 kg K_2O/ha are used as recommended dose of fertilizers during the experiment and fertilizer requirement calculated individually on the basis of each plot. A uniform distance of sixty centimetres of row to row

and twenty centimetres distance of plant to plant is maintained. Data were subjected to analysis of variance (ANOVA) for Factorial Randomized Block Design. The results were presented at 5% level of significance (P=0.05) and critical difference (CD) values were calculated to compare the treatments.

RESULT AND DISCUSSION

Emergence Percentage at 30 DAP

The data pertaining emergence percentage of potato was recorded at 30 days after planting is given in Table no.1. It is evident from the data, significantly higher emergence percent (92.70, 94.30 and 93.50) was recorded during first, second as well as in mean data during the experiment in the treatment (20 days early planting on 17 October) among different planting dates.However, the treatment (10 days early planting on 27 October) recorded statistically at par values (91.60, 93.10 and 92.30). Whereas among different mulching practices, significant variation were noticed. However, maximum emergence percentage (90.20, 91.60 and 90.90) was during first, second as well as in mean data during the experiment in treatment of Organic mulch (paddy straw at 5 t/ha) which were statistically at par (89.10, 91.20 and 90.10) with Plastic mulch (black colour) during all experimental years.

Mulching increased the soil temperature, improved the soil characteristics and improved early plant growth. **Singh *et al.* (2019)**.These could be attributed to the higher temperature and humidity under mulched during the early development. As a result, mulching led to the higher emergence rate and strong seedling, accordingly increased the stems and branches per plant, leading to a greater number of tubers in tuber initiation. **Bharati *et al.* (2020) and** Similar findings were also **recorded Phuleshwar*et al.* 2020.**The higher emergence percentage could beattributed to favourable climatic conditions in general andtemperature in particular. Similar findings were in agreementwith the earlier reported by **Thongam*et al*.(2017) and Meena *et al.* (2023).**

Plant height (cm) at 45 DAP

Analysed dataTable no.1of planting dates represent significant difference among all the treatments. 20 days early planting on 17th October recorded significantly maximum plant height (40.40, 42.20 and 41.30 cm) which was at par with the plot where 10 days early planting on 27th October (38.70, 40.60 and 39.60 cm) in first year, second year and in mean data, respectively at 45 DAP,.At 45 DAP, mulching practices also obtained significant variation among different treatments. Plant height (35.70, 37.50 and 36.60 cm) was significantly higher in all of the experimental years with Organic mulch (Paddy straw at 5 t/ha) and at par values (34.80, 36.70 and

35.70 cm) were observed with Plastic mulch (Black colour) in all of the experimental years, respectively.The better growth inplanting date might be due to prevalence of favourabletemperature required for better vegetativegrowth. Similar findings were also reported by **Thongam*et al.*(2017).**The beneficial effects of mulching in increasing plant height.**Das *et al.*(2018).**Mulch materials created favourable condition for the growth of plant. Such response was mainly due to the physiochemical and biological improvement occurred in the soil including favourable temperature and moisture regimes, nutrient availability and microbial activity in mulch condition. **Bharati *et al.* (2020)**. Comparatively retarded growth attributes recorded due to late planting might be due to the lower temperature experienced by the plants at these growth stages which lead to reduced allocation of assimilates. Similar observations have been reported by **Athira *et al*.(2021).** Delay in planting shortens the duration of the cropdue to physiological maturity of seed tuber and prevailingtemperature during the crop-growth period.**Satapathy *et al*. (2016).**

Numbers of compound leaves/hill at 45 DAP

Data has been presented in Table no.1. At 45 DAP, there was significant difference of different dates of planting in both the years and in mean data analysis. Number of compound leaves/hill (57.10, 57.40 and 57.30) was significantly higher in treatment 20 days early planting on 17th October and at values were reported in 10 days early planting on 27th October (55.40, 56.00 and 55.70) in both the years of investigation and in mean analysed data.At 45 DAP, mulching practices obtained non significant variation among different treatments.However, maximum number of compound leaves/hill (53.70, 54.20 and 53.90) was recorded in Organic mulch (Paddy straw at 5 t/ha)treated plot in both years and in mean analysis. The plants under mulching treatment attained significantly more height and number of leaves per plant as compared to unmulched treatments. The progressive increase in the parameters may be attributed to the fact that the organic mulching added organic matter and plant nutrients to the soil after decomposition, which in turn increased the vegetative yield. **Shukla *et. al.* (2020)**

Number of tubers/plot

The data pertainingto number of tubers/plot of potato crop regarding dates of planting and different mulching were presented in below Tableno.2. The data on the number of tubers/plot as influenced by different planting dates and mulching showed significant difference.However, potato planted on 20 days early planting on 17 October recorded significantly higher (603.80, 640.00 and 621.90)number of tubers/plot and none of the treatments found statistically at par

value during first, second as well as in mean data also. Whereas in case of mulching practices, number of tubers/plot was significantly affected among different treatments. Significantly maximum number of tubers/plot was observed in plot having Organic mulch (Paddy straw at 5 t/ha) (513.0, 552.8 and 532.9) which was at par with Plastic mulch (Black colour) (492.0 and 508.9) during 2018 and in mean data of investigation and pooled data has been found at par value. This may be due to the reason that the plants were morevigorous in terms of height and foliage which synthesizedmore food ultimately leading to higher number of tubers.**Bharat and Kumar (2021).**More number of tubersin planting date could be attributed to significantlystrong growth in terms of height and number of leaves perplant which has produced more photosynthetic area resultingin production of high quantity of photosynthates,subsequently their translocation to the formation of morenumber of tubers coupled with the favourable temperatureswith required humidity might have resulted in production ofmore number of tubers in the plants of this planting date.These results are in conformity with the earlier findings of **Thongam*et al*.(2017).**

Weight of tubers/plot (kg)

The analysed data representedTable no.2. Significant difference among all the treatments of different dates of planting. In first year, second year and in mean analysis, 20 days early planting on 17th October recorded significantly higher weight of tubers/plot (37.20, 37.80 and 37.50) and there was no at par values recorded among the treatments. However Organic mulch (Paddy straw at 5 t/ha) treated plot recorded significantly higher weight of tubers/plot (34.10, 34.60 and 34.30) during all experimental years and at par values were reported none.The better growth interms of stems per hill appeared to have been due to more eyes present in the large size tubers, which resulted in higher tuber yield per plant and finally accompanied by a corresponding increase in tuber yield per hectare. **Kumar *et al.* (2009).**Theyield components and yield of potato were positively influenced by the use of paddy straw mulch. **Satapathy *et al*. (2016).**Tuber yield was negatively correlated with the time of planting and delayed plantings caused significant loss of yield. The beneficial effect of early planting might be associated with the prevalence of low temperature during the tuber development stage.Similar findings also observed by **Gogoi and Ray (2019).**

Number of tubers/plant

Table no.2 analysed data showed. Significant difference among all treatments of different dates of planting regarding number of tubers per plant. In first year (2018), second year (2019) and in mean analysis, 20 days early planting on 17th October recorded significantly higher number of tubers/plant (10.10, 10.70 and 10.40) and none of the treatments reported at par value. Whereas

significantly higher number of tubers/plant was obtained in organic mulch (Paddy straw at 5 t/ha) treated plot (8.60, 9.20 and 8.90) and at par values are reported in Plastic mulch (Black colour) treated plot (8.20, 8.80 and 8.50), respectively.

The more number of tubers per plant is attributed by more leaf area which directly related to more photosynthesis products.Similar results was obtained by **Navneet *et al.* (2020).**

This might be due to the better plant growth in terms of plant height and number of leaves, coupled with favourable temperature and soil moisture conditions. It might have helped in formation of more photosynthetic area which resulted in accumulation of photosynthates and their translocation to tubers. Also, the stolon initiation and tuber development might have coincided with suitable temperature might have resulted in more number of tubers per plant. Similar findings have been reported by **Athira *et al*.(2021).**This might be due to adequate moisture and better utilization of solar radiation for proper growth and development of crops which turn in more number of tuber/plant which ultimately showed higher yield.**Similar trend of results also reported by Vishwas *et al*. (2020).**

CONCLUSION

From the result of present experiment it can be concluded that the 20 Days Early Planting On 17th October and Organic Mulch (Paddy Straw at 5 t/ha) found superior results in respect to growth and yield attributes and yield of potato crop.

Table : 1. Effect Of Different dates of planting and Different mulches on Growth attributes of Potato

Treatments	Emergence Percentage at 30 DAP			Plant height (cm) at 45 DAP			Numbers of compound leaves/hill at 45 DAP		
	2018	2019	Mean	2018	2019	Mean	2018	2019	Mean
Date Of Planting(Factor-A)									
20 Days Early Planting On 17th October	92.70	94.30	93.50	40.40	42.20	41.30	57.10	57.40	57.30
10 Days Early Planting On 27th October	91.60	93.10	92.30	38.70	40.60	39.60	55.40	56.00	55.70
Optimum Planting Time On 7th November	89.00	91.50	90.30	35.50	37.40	36.40	53.60	54.30	54.00
10 Days Late Planting On 17th November	88.30	89.20	88.80	31.10	33.00	32.00	51.40	51.60	51.50
20 Days Late Planting On 27th November	85.10	87.50	86.30	27.30	29.30	28.30	47.90	48.20	48.10
F test	S	S	S	S	S	S	S	S	S
SE(m)±	0.49	0.38	0.42	0.66	0.63	0.64	0.84	0.86	0.85
CD (p=0.05)	1.40	1.26	1.20	1.90	1.80	1.82	2.43	2.45	2.43
Different Mulches(Factor-B)									
Organic Mulch (Paddy Straw at 5 t/ha)	90.20	91.60	90.90	35.70	37.50	36.60	53.70	54.20	53.90
Plastic Mulch (Black Colour)	89.10	91.20	90.10	34.80	36.70	35.70	53.20	53.60	53.4
Control (Without Mulch)	88.80	90.60	89.70	33.40	35.20	34.3	52.40	52.80	52.60
F test	S	S	S	S	S	S	NS	NS	NS
SE(m)±	0.38	0.34	0.32	0.51	0.49	0.49	0.65	0.66	0.65
CD (p=0.05)	1.10	0.97	0.92	1.47	1.39	1.41	-	-	-

Table :2. Effect Of Different dates of planting and Different mulches on Yield Attributes of Potato

Treatments	Number of tubers/plot			Weight of tubers/plot (kg)			Number of tubers/plant		
	2018	2019	Mean	2018	2019	Mean	2018	2019	Mean
Date Of Planting (Factor-A)									
20 Days Early Planting On 17th October	603.80	640.00	621.90	37.20	37.80	37.50	10.10	10.70	10.40
10 Days Early Planting On 27th October	535.00	576.3	555.60	35.70	36.20	35.90	8.90	9.60	9.30
Optimum Planting Time On 7th November	480.00	520.0	500.00	33.70	34.20	34.00	8.00	8.70	8.30
10 Days Late Planting On 17th November	441.30	481.3	461.30	31.50	32.10	31.80	7.40	8.00	7.70
20 Days Late Planting On 27th November	407.50	438.8	423.10	28.90	29.30	29.10	6.80	7.30	7.10
F test	S	S	S	S	S	S	S	S	S
SE(m)±	11.74	11.82	10.83	0.18	0.16	0.16	0.20	0.20	0.18
CD (p=0.05)	33.63	33.84	31.03	0.50	0.45	0.45	0.56	0.56	0.52
Different Mulches(Factor-B)									
Organic Mulch (Paddy Straw at 5 t/ha)	513.0	552.8	532.9	34.10	34.60	34.30	8.60	9.20	8.90
Plastic Mulch (Black Colour)	492.0	525.8	508.9	33.40	34.00	33.70	8.20	8.80	8.50
Control (Without Mulch)	475.5	515.3	495.4	32.70	33.20	32.90	7.90	8.60	8.30
F test	S	S	S	S	S	S	S	S	S
SE(m)±	9.10	9.15	8.39	0.14	0.12	0.12	0.15	0.15	0.14
CD (p=0.05)	26.05	26.21	24.03	0.39	0.35	0.35	0.43	0.44	0.40

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