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Effect of different methods of sowing and mulching levels on growth and yield of wheat. (*Triticum aestivum* L.)

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Abstract
The present investigation entitled, "Effect of different methods of sowing and mulching levels on growth and yield of Wheat (*Triticum aestivum* L.)" was carried out at student's research farm, Khalsa College, Amritsar during *Rabi* season of 2017-18. The experiment was laid out in split plot design with twelve treatments comprising of planting methods (P_1-Bed planting, P_2-Zero tillage, P_3-Flat planting); and sub plots consisting of four mulch levels (M_1-no mulch, M_2-mulch @ 3t/ha, M_3- mulch @ 4.5t/ha, M_4-mulch @ 6t/ha) soil of the experimental field was loamy texture with normal pH and electrical conductivity, medium in organic carbon, low in available N and high in available P and available K. Bed planting (P_1) had significantly higher growth, yield and yield attributes than Flat planting (P_3) and Zero tillage (P_2) and among mulching levels 6t/ha (M_4) resulted significantly higher growth, yield and yield attributes. Maximum benefit cost ratio was recorded in crop sown with Bed planting (P_1) and mulch level @ 6t/ha (M_4) which was at par with mulch @ 4.5t/ha.

Keywords: Wheat, mulching levels, methods of sowing, rice straw

Introduction
Wheat (*Triticum aestivum* L.) represents staple food in most of the world; it is an inevitable part of human life. In terms of total production, it is second to rice as the main human food crop and ahead of maize (Anon., 2016) [1]. In India, Punjab is one of the major wheat producing state. It accounts for about 11.3 per cent of the wheat area (34.78 lac ha) and produces about 18 per cent (176.46 lac tons) of the total wheat production in India. Under present circumstances demand of food grains is increasing due to ever increasing of human population. But problem resources are dwindling i.e. declining soil fertility, water resources, land area etc. To sustain food grain production to the level of demand, there is need to use existing resources efficiently. Among different resources, water and soil are important ones. Agronomic technologies like methods of sowing and mulching levels play a vital role in establishment of wheat. The purpose of placement of seed at proper depth which ensures better emergence and subsequent crop growth is done by using suitable sowing methods. The planting of wheat with different planting methods depending upon the available soil water, time of planting, amount of residue in the field and availability of planting machine. The planting method such as zero tillage is the best technique for farmers to reduce the cost of cultivation. Therefore the zero tillage has many benefits such as saving diesel, labour, money and environment from pollution. Zero tillage's impact in the Indo-Gangetic Plains has been achieved through an intervention that proved privately attractive; an enabling process that combined elements of persistence, flexibility, inclusiveness, and facilitation; and a context that implied a need for change. To replicate and extend the success so far achieved, we must develop viable and dynamic innovation systems that can deliver and adapt interventions such as zero tillage. Addressing the knowledge gaps concerning zero tillage's socioeconomic, livelihood and environmental impacts would enhance the ability to do so in a cost-effective, equitable and sustainable manner. The technique of bed planting is useful for improving resource use efficiency and increases the yield. The land is prepared conventionally whereas furrows and raised bed are prepared manually in this system. Growing of wheat on raised beds were other countries of the Indo-Gangetic plain few years ago, whereas in Bangladesh, it is introduced very recently. There are several advantages associated with bed planting systems i.e. management of irrigation water is improved is simpler, and more efficient. It increased the fertilizer efficiency because of better placement including top dress applications. Weeds between beds can be controlled mechanically, early in the crop cycle. On raised beds, border effects allow the canopy to intercepts solar radiation, it strengthens the straws, and the soil around the base of the plant is drier to prevent crop from lodging.

Mulching is the practice of covering the soil with a material such as paddy straw or wheat straw etc. It suppresses weeds and helps in maintains soil moisture, improving physical, chemical and biological properties of soil. The paddy straw is useful for the purpose of mulching and is easily available and provides solution for rice straw management. Mulches hinder weed growth, lessen soil moisture evaporation and improve the visual qualities of landscapes. Organic mulches results in enhanced soil water status and improved plant canopy in terms of biomass, root growth, leaf area index and grain yield, which subsequently resulted improve water and nitrogen uptake and their use efficiencies with reducing runoff and evaporation losses. Straw mulch is practiced successfully in many advanced countries like America and Australia where it improved many soil aspect as support soil moisture retention ability, prevent wind erosion, nutrient return etc. Mulching is considered a comprehensive approach to reduce water loss and water use from soil surface.

Material and Methods

The field experiment was conducted at Students' Research Farm, Khalsa College, Amritsar during *Rabi* 2017-18. The experiment was laid out in split plot design having 12 treatments with 3 replications and important agronomic practices followed during the experiment from seed bed preparation to harvesting of the crop. The climate, soil condition, design of experiment, materials used and procedures, growth character, yield and yield attributing characters, meteorological characters followed during the course of investigation.

Result AND Discussion

Emergence count per meter square

The emergence count is the number of plants that were able to germinate and come out from soil surface. Ultimately, yield of the crop is directly related to established plant population. The data depicted that emergence count was not significantly influenced due to different sowing methods i.e. bed planting (P_1), zero tillage (P_2) and flat sowing (P_3). Uniform emergence count recorded in all the main plots. In sub plot treatments data showed that effect of different mulching treatments like no mulch (M_1), 3 t/ha (M_2), 4.5 t/ha (M_3) and 6 t/ha (M_4) on emergence count was also non-significant. The proper emergence is based on accurate seed placement and timely sowing.

Growth characters

Periodic plant height (cm)

Data in (table1) reveals that plant height varied significantly due to various treatments at 60, 90, and 120 DAS as well as at harvest. However, at 30 DAS, the differences in plant height were due to sowing methods and mulch levels did not reach the level of significance. Data further reveals that increased with increase in age but the magnitude of in plant height was more up to 90 DAS. Bed planted crop recorded the significantly highest plant height as compared to other two methods i.e. zero tillage and flat planting which were statistically at par with each other. Similarly trend was observed at 90 and 120 as well as at harvest. Irrespective of mulch levels, all the levels recorded higher plant height than no mulch treatment. The plant height of mulch levels like as 6t/ha (M_4) and 4.5 t/ha (M_3) were statistically at par with each other but significantly higher plant height than mulch levels i.e., 3t/ha (M_2) and no mulch (M_1). These finding are in line with by Pandey *et al.* (1997) [2].

Periodic dry matter accumulation

Dry matter accumulation increased in all the treatments with the increase in age of crop (Table 2) it has been found that dry matter accumulation of wheat was significantly affected by different methods of sowing at all the observational periods viz., 60, 90, 120 DAS and at harvest except 30 DAS. At 30 DAS, Bed planting (P_1) resulted in higher dry matter accumulation than flat planting (P_3) and Zero tillage (P_2) method but it could not reach the level of significance and remains statistically in all the similar planting methods. Further it revealed that at 60, 90, 120 DAS and at harvest, dry matter accumulation for bed planting was significantly highest than flat planting and zero tillage method. Bed planting (P_1) recorded 5.59 and 7.59 percent higher dry matter than flat planting (P_3) and zero tillage (P_2) at harvesting. Similarly, found that wheat under zero tillage treatment had similar dry matter as observed in conventional seeding system. Periodic dry matter accumulation was also significantly influenced by different mulching levels treatments. At 30 DAS, there was no significant difference in dry matter accumulation in all the treatments. Maximum dry matter accumulation was recorded in 6t/ha (M_4) treatment and minimum under no mulch at 60, 90, 120 DAS and at harvest. Further mulching levels No mulch (M_1) and 3t/ha (M_2) were at par with each other and significantly differ with 4.5t/ha (M_3) and 6t/ha (M_4) treatments whereas 4.5t/ha (M_3) and 6t/ha (M_4) were also at par with each other. Under mulching level 6t/ha (M_4) recorded 8.83, 5.63 and 1.16 percent higher dry matter than No mulch (M_1), 3t/ha (M_2) and 6t/ha (M_4). These findings were line with Parmar and Sharma (1998) [3].

Leaf area index

Leaf area index is a major character influencing crop assimilation capacity. It is important growth parameter governing the photosynthetic activity of the plants. The data presented in (Table 3) depicted that the leaf area index (LAI) increase with increase in crop age up to 90 DAS and decreased thereafter due to senescence of leaves. Leaf area index was influenced significantly with different sowing methods throughout the crop growth period except at initial stage of 30 days of crop age. It followed the decreasing order of $P_1>P_3>P_2$. The data regarding influence of different treatments on leaf area index at 30, 60, 90, 120 days after sowing. It indicate that leaf area index at 60, 90, 120 DAS under different mulch levels varied significantly. Leaf area index under Bed planting (P_1) was significantly higher than Zero tillage (P_2) and Flat Planting (P_3) on 60, 90 and 120 DAS. Leaf area index at 30 DAS was not significantly affected by different methods of sowing and mulching levels. Mulch levels 6t/ha (M_4) and 4.5t/ha (M_3) had significantly higher leaf area index than mulching levels no mulch (M_1) and 3t/ha (M_2). These findings are in line with Mollah *et al.* (2009) [4].

Yield attributes

Number of effective tillers per metre square

Tillering is an important determinant of grain yield in Wheat. Good tillering results in more number of ears per unit area which leads to better harvest. Effective tillers count is a significant parameter which helps in the determination of yield of wheat crop. Bed planting (P_1) had significantly higher number of effective tillers than zero tillage (P_2) and flat planting (P_3). The number of effective tillers of zero tillage (P_2) and flat planting (P_3) were statistically at par with each other under mulching levels 6t/ha (M_4) and mulching level

4.5t/ha (M_3) were at par with each other. Mulching level 6t/ha (M_4) had significantly highest number of effective tillers than mulching level 3t/ha (M_2) and no mulch (M_1). The data regarding number of effective tillers presented in (table 4).

Ear length

The ear length is one of the important yield contributing character of wheat as it considered that more the length of ear head more will be the number of grains. A perusal of the data (table 5) reveals that length of ear was significantly affected by planting methods. Among different methods of sowing, Bed planting (P_1) method recorded significantly more ear length than flat planting (P_3) and zero tillage (P_2) methods. Effect of different mulching levels on ear length was also significant. Ear length of mulch level 6t/ha (M_4) treatment and mulch level 4.5t/ha (M_3) treatment were at par but both were significantly higher than mulching level 3t/ha (M_2) and no mulch (M_1) which were also at par with each other.

Number of grains per ear

Number of grains per ear is an important index of grain yield. It revealed that the methods of sowing significantly influenced the number of grains per ear. Bed planting (P_1) method produce significantly higher number of grains per ear than flat planting (P_3) and zero tillage (P_2) methods. Further, it was observed that number of grains per ear produced in flat planting (P_3) was statistically at par with zero tillage (P_2) method. Higher number of grains per year in bed planted wheat may be due to proper distribution of plants and longer ears with more number of spikelets per ear because there in bed planting better light conditions in canopy for photosynthesis and reduction in weed biomass. These results are in accordance with Ram *et al.* (2012) [5] and Bhat and Mahal (2006) [6].

Similarly different mulching levels have significant effect on number of grains per ear. Mulching level 6t/ha (M_4) have significantly highest number of grains per ear than mulching level 3t/ha (M_2) and no mulch (M_1). This was due to the improvement of Physical, Chemical and Biological properties of soil. These improvements of soil health which respond to proper growth of plant no mulch. Mulching levels 6t/ha (M_4) and mulching level 4.5t/ha (M_3) were at par with each other.

1000 grain weight

1000 grain weight is an important yield attributing character of wheat indicating boldness and size of the grains. The data showing that test weight was similar under all planting methods. Although there was significantly higher 1000 seed weight of bed planted wheat over flat planted and zero tilled wheat but flat planted wheat and zero tilled wheat was not gets reached up to level of significance. Under mulching levels 6t/ha (M_4) and mulching level 4.5t/ha (M_3) were at par with each other. Mulching level 6t/ha (M_4) had significantly highest 1000 grain weight than mulching level 3t/ha (M_2) and no mulch (M_1).

Grain yield (q/ha)

The grain yield constitutes the most important component concerning the economic return of wheat crop. Grain yield is the end product and is net result of various inputs, influencing growth and yield contributing characters. The data with respect to grain yield is presented in (Table 6) which showed that various treatments viz. different methods of sowing and mulching levels had a significant effect on grain yield. Bed planting (P_1) had significantly higher grain yield than other methods of sowing i.e. flat planting (P_3) and zero tillage (P_2) method which were at par with each other. Bed planted wheat produced 12 percent and 10 percent more grain yield than zero and flat method of sowing, respectively. This may be due to better growth parameters i.e. leaf area index, dry matter accumulation, plant height and better yield parameters i.e. effective tiller count, grains per ear and 1000 grain weight. These results were in line with the results of Mollah *et al.* (2009) [4]. Among Mulching levels also influenced the grain yield significantly, mulch 6t/ha (M_4) had significantly higher grain yield than no mulch (M_1) and 3t/ha (M_2) but at par with 4.5t/ha (M_3). Similarly, 3t/ha (M_2) had higher grain yield than no mulch but was not significant. This difference is due to the efficient use of fertilizers, less weed population, high organic matter, less volatization and decomposed straw mulch, thereby improved the growth parameters viz. plant height, LAI, dry matter accumulation and development of yield components such as number of effective tillers, number of grains per ear and thus finally increased grain yield.

Straw Yield

Straw yield is an important parameter of biological yield to evaluate its productivity index for judging the ultimate performance of a crop. Thus, wheat straw makes a major contribution to the efficiency of various treatments tested in an experiment. The data on straw yield as influenced by different treatments has been recorded and presented in (Table 6). Higher straw yield was observed with Bed planting (P_1) (61.19 q/ha) and lowest in case of zero tillage (P_2) (54.56 q/ha) and flat planting (P_3). Bed planting (P_1) had significantly higher straw yield than zero tillage (P_2) and flat planting (P_3). This may be due to the higher vegetative growth of plants and improved growth of plants and improved growth parameters, yield attributes and hence increased biomass. The results are in line with Mollah *et al.* (2009) [4]. Between mulching levels 6ton/ha (M_4) and 4.5t/ha (M_3) produced significantly more straw yield than no mulch (M_1) and 3t/ha (M_2). Maximum (59.83 q/ha) straw yield was under mulching level 4.5t/ha (M_3) and minimum (54.92 q/ha) under no mulch (M_0). This may be due to more plant height, LAI, dry matter and number of tillers. Results were same as the results of Ahmad *et al.*, (2007) [7].

Biological yield (q/ha)

Mulching levels 4.5t/ha (M_3) produced significantly higher biological yield than no mulch (M_1) and 3t/ha (M_2) but at par with 6t/ha (M_4). Maximum (109.85 q/ha) biological yield was under 6t/ha (M_4) mulching level and minimum (97.66 q/ha) was under no mulch (M_0) treatment.

Table 1: Effect of different methods of sowing and mulching levels on emergence count of wheat

Treatments	Plant height (cm)				
Sowing methods	**30DAS**	**60 DAS**	**90 DAS**	**120 DAS**	**At harvest**
Bed planting (P_1)	22.09	35.16	67.59	94.31	95.78
Zero tillage (P_2)	21.04	32.66	63.39	89.69	91.8
Flat sowing (P_3)	21.02	33.44	64.69	91.13	93.01
CD (P = 0.05)	NS	1.62	1.92	2.84	2.24
Mulch levels					
No mulch (M_1)	20.97	30.83	63.71	89.42	90.76
3 t/ha (M_2)	21.18	31.92	64.69	90.08	91.84
4.5 t/ha (M_3)	21.51	35.61	65.99	92.95	95.42
6 t/ha (M_4)	21.86	36.66	66.50	94.39	96.08
CD (P = 0.05)	NS	1.21	1.26	2.01	1.79

Table 2: Effect of different method of sowing and mulch techniques on dry matter accumulation of wheat

Treatments	Dry matter accumulation				
Sowing methods	**30DAS**	**60 DAS**	**90 DAS**	**120 DAS**	**At harvest**
Bed planting (P_1)	5.25	23.32	66.48	86.89	97.13
Zero tillage (P_2)	4.25	20.33	60.44	80.0	90.27
Flat planting (P_3)	5.17	21.78	62.41	81.91	91.98
CD (P = 0.05)	NS	1.52	3.68	4.96	4.95
Mulch levels					
No mulch (M_1)	4.69	19.21	59.64	78.98	88.81
3 t/ha (M_2)	4.73	20.56	60.63	80.65	91.5
4.5 t/ha (M_3)	5.03	23.61	65.32	85.30	95.55
6 t/ha (M_4)	5.13	23.86	66.85	86.81	96.66
CD (P = 0.05)	NS	1.53	3.10	3.94	3.69

Table 3: Effect of different method of sowing and mulch techniques on leaf area index of wheat

Treatments	Leaf Area Index			
Sowing methods	**30 DAS**	**60 DAS**	**90 DAS**	**120 DAS**
Bed planting (P_1)	0.31	3.02	5.39	4.81
Zero tillage (P_2)	0.29	2.28	4.58	4.2
Flat planting (P_3)	0.27	2.53	4.85	4.30
CD (P = 0.05)	NS	0.26	0.37	0.24
Mulch levels				
No mulch (M_1)	0.27	2.45	4.59	4.19
3 t/ha (M_2)	0.29	2.47	4.82	4.33
4.5 t/ha (M_3)	0.30	2.74	5.13	4.61
6 t/ha (M_4)	0.31	2.78	5.22	4.62
CD (P = 0.05)	NS	0.20	0.29	0.19

Table 4: Effect of different methods of sowing and mulching levels on effective tillers of wheat

Treatments	No. of effective tillers
Sowing methods	
Bed planting (P_1)	289
Zero tillage (P_2)	253
Flat planting (P_3)	274
CD (P = 0.05)	12.3
Mulch levels	
No mulch (M_1)	258
3 t/ha (M_2)	266
4.5 t/ha (M_3)	279
6 t/ha (M_4)	285
CD (P = 0.05)	11.5

Table 5: Effect of different methods of sowing and mulching levels on ear length, numbers of grains per ear and 1000 grains weight (g) of wheat

Treatments	Ear length (cm)	No. of grains per ear	1000 Grain weight (g)
Sowing methods			
Bed planting (P_1)	12.87	71.69	37.93
Zero tillage (P_2)	10.80	66.62	34.76
Flat planting (P_3)	11.19	68.25	37.26
CD (P = 0.05)	1.37	3.39	NS
Mulch levels			
No mulch (M_1)	11.0	65.87	35.37
3 t/ha (M_2)	11.25	67.68	36.15
4.5 t/ha (M_3)	12.01	70.46	37.48
6 t/ha (M_4)	12.21	71.39	37.6
CD (P = 0.05)	0.73	2.49	NS

Table 6: Effect of different method of sowing and mulching levels on grain yield, straw yield and biological yield

Treatments	Grain yield	Straw yield	Biological yield
Sowing methods			
Bed planting (P_1)	48.87	61.12	109.85
Zero tillage (P_2)	43.48	54.49	97.66
Flat planting (P_3)	44.28	56.43	100.59
CD (P = 0.05)	3.82	4.26	5.43
Mulch levels			
No mulch (M_1)	42.89	54.92	97.20
3 t/ha (M_2)	44.18	55.64	99.88
4.5 t/ha (M_3)	47.30	58.99	106.28
6 t/ha (M_4)	47.80	59.83	107.44
CD (P = 0.05)	2.21	3.29	5.22

Conclusion

The results of one year study can be abridged as Bed planted wheat had higher produce and more economical as compared to other methods of sowing. Mulch level 6t/ha recorded yield advantage over no mulch and other mulch levels.

References

1. Anonymous, 2016. http://www.tutiempo.net.inclimate/amritsar/420710.htm.
2. Pandey IB, Mishra SS, Singh SJ. Effect of seed-furrow mulching, nitrogen rates and weed management practices on growth and yield of late sown wheat (*Triticum aestivum* L.). Indian J agron. 1997; 42(3):463-467.
3. Parmar DK, Sharma PK. Effect of phosphorus and mulching on root growth parameters, nutrient interrelations and biomass productivity of wheat (*Triticum aestivum*) in a mountain Alfisol. Indian J agric Sci. 1998; 68:194-197.
4. Mollah MIU, Bhuiya MSU, Kabir MH. Bed Planting-A New Crop Establishment Method for Wheat in Rice-Wheat Cropping system. J Agric Rural Dev. 2009; **7**(1&2):23-31.
5. Ram H, singh Y, Saini KS, Kler DS, Timsinas J, Humphreys E. Agronomic and economic evaluation of permanent raised beds, no tillage and straw mulching for an irrigated maize wheat system in north west India. Expl Agric. 2012; 98**:**21-38.
6. Bhat MA, Mahal SS. Performance of wheat (*Triticum aestivum* L.) genotypes under different planting and weed control methods. Crop Res. 2006; 32(2):153-56.
7. Ahmad IZ, Ansar M, Iqbal M, Minhas MN. Effect of planting geometry and wheat straw mulch on performance of wheat under rainfed conditions of Pothowar. Pakistan J agric Res. 2007; 22(3-4):112-115.