www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(8): 700-703
© 2022 TPI
www.thepharmajournal.com
Received: 01-05-2022
Accepted: 06-06-2022

Sorokhaibam Bijayalakshmi Devi
Department of Agronomy, College of Agriculture, Central Agricultural University, Imphal, Manipur, India

Edwin Luikham
Department of Agronomy, College of Agriculture, Central Agricultural University, Imphal, Manipur, India

Shashidhar KS
Faculty of Veterinary and Animal Sciences (Agronomy), Institute of Agricultural Sciences, Rajiv Gandhi South Campus, Banaras Hindu University, Mirzapur, Uttar Pradesh, India

Indira Sarangthem
Department of Soil science and Agricultural Chemistry, College of Agriculture, Central Agricultural University, Imphal, Manipur, India

N Gopimohon Singh
Department of Agriculture Statistics, College of Agriculture, Central Agricultural University, Imphal, Manipur, India

Corresponding Author:
Sorokhaibam Bijayalakshmi Devi
Department of Agronomy, College of Agriculture, Central Agricultural University, Imphal, Manipur, India

Influence of row spacing and different types of mulch on growth and yield of lentil (*Lens culinaris* L. Medik)

Sorokhaibam Bijayalakshmi Devi, Edwin Luikham, Shashidhar KS, Indira Sarangthem and N Gopimohon Singh

Abstract
A field investigation was conducted at Agronomy Research Farm, College of Agriculture, Central Agricultural University, Imphal during *Rabi* season of 2019-20. The experiment was laid out in Factorial Randomized Block Design (FRBD) with three replications. The present investigation disclosed that among the three row spacings, crop sowed at 40 cm (S_3) recorded significantly higher growth attributes viz., plant height, fresh and dry weight of plant and number of branches/plant. Furthermore, yield parameters viz., number of pods/plant and number of seeds/pod were also recorded higher in wider (40 cm) row spacing but seed yield, stover yield and harvest index were found higher in 30cm row spacing. Among the different mulches, paddy straw mulch 10t/ha (M_3) showed the most significant effect on plant height, number of branches, pods/plant, number of seeds/pod, seed yield, stover yield. Significantly higher seed yield was obtained at 30cm row spacing with paddy straw mulching (12.79 q/ha).

Keywords: Plant height, row spacing, mulching, lentil, yield

Introduction
Lentil (*Lens culinaris* L. Medik) is an important winter season annual legume predominantly grown in rainfed conditions, known for its high lysine and tryptophan content. Consumption with cereals like wheat or rice provides a balance in essential amino acid supplements. India occupies second position in the world in lentil production after Canada. After chickpea, pigeon pea, mungbean and urd bean, it is the fifth most important pulse crop in India in terms of production. Lentil is grown in almost all the states as a *rabi* pulse crop, including Madhya Pradesh, Uttar Pradesh, Bihar, West Bengal and Rajasthan. In India, lentil is cultivated in an area of about 1.27 million hectares with production of 0.97 million tonnes and average productivity of 765 kg/ha. (Anon., 2015-16) [2].
Production of pulse in 2017-18 was 25.23 million tons (Anon., 2019) [3]. The country witnessed near self-sufficiency in pulses. By 2050, the domestic requirements would be 26.50 million tons, stepping up production by 81.50%, i.e., 11.9 million tons additional produce at 1.86% annual growth rates (Singh, *et al.*, 2015) [13]. About 2-3 million tons of pulses are imported annually to meet the domestic consumption requirement. Thus, there is need to increase the production and productivity of pulses in the country by more intensive interventions.
In India some research works with plastic mulch on plantation crops and vegetable crops has been reported. However, use of plastic mulch for field crops is still at a developmental stage. Organic mulches add nutrients to soil when decomposed by microbes. Favourable soil edaphic environment under mulch improves crop productivity, enhances input-use efficiency and checks environmental pollution. A rice crop yields a large amount of straw, which from the standpoint of health and environmental pollution, is one of the most critical problems in rice producing countries (FAO, 1982) [8]. A major portion of it is combusted on fields causing a great hazard to public health and the environment. Therefore, considerable attention has been placed on using straw in composting and feeding animals as it is cheap and abundant (Abdelhamid *et al*., 2004) [1].
In Manipur, rice husk is also one of the waste in the valley areas and mill owner's burn down causing environmental pollution. The economic use of this waste product will help a lot to the poor farmers in successful crop production and the successful use of rice husk for mulching in other crops have been reported. Hence, the feasibility of rice husk needs to be tested. Keeping the above points in view, a field experiment was conducted to find out best and optimum row spacing and mulching practices to assess their effect on growth and yield of lentil under rainfed condition.

Materials and Methods

A field experiment was conducted during *Rabi* season of 2019 at Research Farm, College of Agriculture, Central Agricultural University, Imphal to study the influence of row spacing and different mulching on growth and yield of lentil. The experimental site is located at 24°45′ N latitude and 93° 54′ E longitudes at an elevation of 774.5 m above mean sea level. The soil of the experimental area was clay in texture with pH 5.1, available nitrogen 255.23 kg/ha, available phosphorous 16.72 kg/ha, available potash 236.7 kg/ha and organic carbon 0.7%. The total annual rainfall received during the course of research was 246.4 mm. HUL-57 was the variety used and the experiment was laid out in Factorial Randomized Block Design (FRBD) with three replications consisting of three row spacing treatments (S_1 : 20 cm x10 cm, S_2 :30 cm x10 cm and S_3 :40 cm x10 cm) and four mulching treatments (M_1 : No Mulching, M_2 : Rice husk @ 10 t/ha, M_3: Paddy straw mulch @ 5t/ha and M_4: Black polythene mulch).

A uniform dose of 20 kg N, 40 kg P_2O_5/ha and 20 kg K_2O/ha was applied uniformly to all plots through urea, SSP and MOP respectively, one day before sowing along an open furrow at a depth of 4-5cm and mixed with the soil properly. The crop was sown by line sowing method at the rate of 75kg/ha (20cm), 50kg/ha (30cm) and 37.5kg/ha (40cm) on 23rd November 2019. Thinning was done to maintain plant to plant distance. The crop was infested with several weed species during early growth stage, hence, two hand weeding were done manually in all plots with the help of khurpi at 20 days after sowing (DAS). Plant protection measures were provided as and when required. All the data obtained were statistically analysed by the method of analysis of variance to test the significance of the treatment effects as well as result interpretation as given by Gomez and Gomez (1984) [10].

Results and Discussion

Effect of row spacing and mulching on growth characters of lentil

Row spacing and mulching effects on growth of lentil in terms of plant height, fresh and dry weight of plant, number of branches per plant is illustrated in Table 1. Row spacing did not influence the plant height, fresh and dry weights of plant significantly at the early stage of crop growth but showed significant during the later stages viz. 60 days after sowing (DAS) till harvest. It may be due to the optimum space available to the plant and less competition during the early stage of growth. Spacing significantly influenced the number of branches per plant at all stages of growth. The highest plant height (22.83 cm), fresh weight of plant (10.69 g), dry weight of plant (6.08 g) and number of branches (7.63) at harvest were observed in 40 cm row spacing (S_3) and lowest in narrow spacing 20 cm (S_1). This might be due to plants grown with wider spacing acquired better opportunity of availing maximum space, light and nutrients which led to produce maximum branches and pods/plant. These results were in conformity with the findings of Soheir (2001) reporting similar results in fababean and Devi *et al.* (2021) [6] in ricebean.

Different mulching practices significantly influenced the growth parameters like plant height, number of branches, fresh and dry weight of plant. Among the different mulches, paddy straw mulch @ 5t/ha recorded the highest plant height (24.24 cm) and remained statistically at par with black polythene mulch. The maximum fresh weight of plant (10.96 g), dry weight of plant (6.13 g) and number of branches (7.70) were observed in paddy straw mulch @ 5t/ha (M_3) and lowest in no mulch (M_1). These results are supported by the earlier findings of Nagalakshmi *et al.* (2002) [12], Eid *et al.* (2013) [7] in soybean and Awal *et al.* (2016) [4].

Among the treatment combination, row spacing 40 cm with paddy straw mulch@ 5t/ha (S_1M_4) showed higher plant height (26.59cm), fresh weight of plant (11.64g), dry weight of plant (6.49g) and number of branches (8.44), while the least was observed in 20 cm row spacing with no mulch (S_1M_1).

Table 1: Effect of row spacing and mulching on growth of lentil.

Treatments	Plant height at harvest (cm)	Fresh weight of plant at harvest (g)	Dry weight of plant at harvest (g)	Number of branches / plant
Row Spacing				
20 cm (S_1)	20.99	9.55	5.73	6.38
30 cm (S_2)	22.29	10.46	5.90	7.25
40 cm (S_3)	22.83	10.69	6.08	7.63
S.E d (±)	0.55	0.26	0.12	0.15
C.D. (P = 0.05)	1.14	0.53	0.25	0.32
Mulching				
No mulching (M_1)	18.62	9.67	5.50	6.21
Rice husk mulch @10 t/ha (M_2)	21.09	9.97	5.88	6.75
Paddy straw mulch @ 5t/ha (M_3)	24.24	10.96	6.13	7.70
Black polythene mulch (M_4)	24.20	10.32	6.10	7.68
S. E d (±)	0.63	0.30	0.14	0.18
C.D. (P = 0.05)	1.31	0.61	0.28	0.36
Interaction				
S_1M_1	18.30	9.11	5.51	5.80
S_1M_2	20.93	9.60	5.73	6.47
S_1M_3	23.00	9.88	5.81	6.61
S_1M_4	21.73	9.63	5.87	6.65
S_2M_1	19.13	10.07	5.52	6.36
S_2M_2	20.53	10.09	5.80	6.61
S_2M_3	25.23	11.37	6.10	8.06
S_2M_4	24.27	10.30	6.18	7.98
S_3M_1	18.44	9.83	5.46	6.47
S_3M_2	21.80	10.23	6.11	7.17
S_3M_3	26.59	11.64	6.49	8.44
S_3M_4	24.48	11.04	6.26	8.42
S. E d (±)	1.10	0.51	0.24	0.30
C.D. (P = 0.05)	NS	NS	NS	0.63

Effect of row spacing and mulching on yield attributes and yield of lentil

The effect of row spacing and mulching on yield of lentil estimated in terms of number of pods per plant, number of seeds per pod, test weight (g), seed yield (q/ha), stover yield (q/ha) and harvest index (%) is presented in Table 2. Performance of row spacing and mulching significantly increased the yield attributing characters like number of pods per plant and number of seeds per pod. Though an increasing trend in test weight was observed with wider spacing (40cm) and mulching with paddy straw @ 5t/ha, it could not bring significant influence to test weight. Number of pods per plant increased significantly with wider row spacing of 40cm i.e. S_3 (96.14) and found higher than S_1 and S_2. The maximum

number of seeds per pod was recorded with 40cm row spacing (1.77) and it remained at par to 30cm row spacing (1.67). Seed yield, stover yield and harvest index% differed significantly among the different row spacing. The ultimate seed yield (14.66 q/ha), stover yield (89.71 q/ha) and harvest index % (33.12) were recorded in 30 cm row spacing (S_2) and lowest in 40 cm (S_3). Yield obtained was higher when the crop is sown at 30cm as the yield is compensated by higher plant population with 30cm row spacing. However in closer spacing 20cm, the competition for available resources among the crops might be higher resulting in low individual performances and hence lower yield is obtained. Thus, optimum row spacing have effectively utilized the growth resources, particularly solar radiation as compared to narrow spaced crops where plants might have suffered due to mutual shading in case of contiguous rows and more plants within case of wider row spacing. These findings were in corroborate with Bhairappavar *et al.* (2005), Singh *et al*. (2009) and Murade *et al*. (2014) [11].

Among mulching, the paddy straw mulch @ 5t/ha recorded significantly higher number of pods per plant (94.11) than black polythene mulch (89.09), rice husk mulch @10t/ha (72.98) and no mulch (61.54). The highest number of seeds per pod was noted with paddy straw mulch@5t/ha (1.81) which remained statistically at par with black polythene mulch (1.71). Seed yield and stover yield also significantly influenced by different mulching treatments (Table 2). The maximum seed yield was recorded in paddy straw mulch @5t/ha (10.25q/ha) and significantly superior than black polythene mulch (8.83q/ha) and rice husk mulch @10t/ha (7.75q/ha). Furthermore, higher stover yield (17.35 q/ha) and harvest index (36.91%) were also observed in paddy straw mulch @ 5t/ha (M_3). This result is in conformity with Ghosh *et al.* (2006) [9].

Interaction effect of spacing and mulching showed significant effect on yield and yield components of lentil (Table 2). The number of pods per plant was obtained highest from 40cm x 10 cm with paddy straw mulch@5t/ha (106.53) and lowest (50.33) in no mulch with 20cm row spacing (S_1M_1). The treatment combination of 30 cm x 10 cm spacing with paddy straw mulch @5t/ha (S_2M_3) gave the highest number of seeds per pod (2.04), test weight (21.57 g), seed yield (12.79 q/ha), stover yield (19.25 q/ha) and harvest index (39.91 %).

Table 2: Effect of row spacing and mulching on yield attributes and yield of lentil.

Treatments	Number of pods /plant	Number of seeds /pod	Test weight (g)	Seed yield (q/ha)	Stover yield (q/ha)	Harvest Index (%)
Row Spacing						
20 cm (S_1)	65.37	1.57	19.91	7.96	14.73	34.82
30 cm (S_2)	75.28	1.67	20.45	10.13	17.40	36.58
40 cm (S_3)	96.14	1.77	20.01	6.88	16.19	26.59
S.E d (±)	2.10	0.07	0.56	0.25	0.49	0.98
C.D. (P = 0.05)	4.36	0.14	NS	0.52	1.01	2.03
Mulching						
No mulching (M_1)	61.54	1.55	19.14	6.46	14.23	29.08
Rice husk mulch @10 t/ha (M_2)	72.98	1.59	19.82	7.75	15.79	30.59
Paddy straw mulch @ 5t/ha (M_3)	94.11	1.81	20.82	10.25	17.35	36.91
Black polythene mulch (M_4)	87.09	1.71	20.71	8.83	17.04	34.05
S. E d (±)	2.43	0.08	0.65	0.29	0.56	1.13
C.D. (P = 0.05)	5.04	0.16	NS	0.60	1.17	2.34
Interaction						
S_1M_1	50.33	1.34	18.62	5.82	13.03	30.83
S_1M_2	55.15	1.53	19.27	7.46	14.88	33.52
S_1M_3	82.78	1.65	21.00	9.81	15.73	38.52
S_1M_4	73.20	1.74	20.75	8.74	15.27	36.39
S_2M_1	61.13	1.65	19.55	7.80	14.76	34.53
S_2M_2	64.33	1.55	19.70	9.38	16.57	36.17
S_2M_3	93.00	2.04	21.57	12.79	19.25	39.91
S_2M_4	82.67	1.43	21.00	10.56	19.01	35.70
S_3M_1	73.17	1.66	19.27	5.77	14.91	27.91
S_3M_2	99.45	1.70	20.49	6.41	15.93	28.60
S_3M_3	106.53	1.73	19.90	8.14	17.08	32.30
S_3M_4	105.39	1.96	20.37	7.20	16.83	30.07
S. E d (±)	4.21	0.13	1.12	0.50	0.98	1.96
C.D. (P = 0.05)	8.72	0.27	NS	1.03	2.03	4.06

Conclusion

Based on the present investigation, superior performances in growth parameters was obtained from the plant sown at 40cm row spacing. However, yield was significantly higher when the crop is sown at 30cm row spacing. Thus, it can be concluded that 30 cm row spacing with paddy straw mulch @ 5t/ha obtained higher seed yield (12.79 q/ha), stover yield (19.25 q/ha) and was found more effective in Lentil.

References

1. Abdelhamid MT, Horiuchi T, Oba S. Composting of rice straw with oilseed rape cake and poultry manure and its effects on faba bean (*Vicia faba* L.) growth and soil properties. Bio-resource Technol. 2004;93(2):183-189.
2. Anonymous. Area, Production and Productivity of Masoor (Lentil) in India. Ministry of Agriculture and Farmers Welfare, Govt. of India, 2015-16.
3. Anonymous. Pulses revolution-from food to nutritional

security. Ministry of Agriculture & Farmers Welfare (Department of Agriculture Cooperation and Farmers Welfare), Government of India, 2019.
4. Awal MA, Dhar PC, Sultan M. Effect of Mulching on Microclimatic Manipulation, Weed Suppression, and Growth and Yield of Pea (*Pisum sativum* L.). Journal of Agriculture and Ecology Research International. 2016;8(2):1-12.
5. Bhairappanavar ST, Jaydeva HM, Gowda TH, Shivanna S. Effect of nutrients and spacing on the yield of Urdbean under late sown condition. Legume Res. 2005;28(1):48-50.
6. Devi KM, Luikham E, Singh LN, Devi NS, Singh NG. Influence of planting geometry and nutrient management on growth, nodulation and yield of dwarf Ricebean (*Vigna umbellata*) under rainfed condition. The Pharma Innovation Journal. 2021;10(9):1766-1770.
7. Eid AR, Bakry BA, Taha MH. Effect of pulse drip irrigation and mulching systems on yield, quality traits and irrigation water use efficiency of soybean under sandy soil conditions. Scientific Res, 2013.
8. FAO. Organic materials and soil productivity. FAO Soil Bulletin. 35 GIN–FAO, Rome, 1982.
9. Ghosh PK, Dayal D, Bandyopadhyay KK, Mohanty M. Evaluation of straw and polythene mulch for enhancing productivity of irrigated summer groundnut. Field Crops Research. 2006;99(2-3):76-86.
10. Gomez KA, Gomez AA. Statistical Procedure for Agricultural Research. 2nd edition John Wiley and Sons, New York, 1984.
11. Murade NB, Patil DB, Jagtap HD, More SM. Effect of spacing and fertilizer levels on growth and yield of urdbean. The Bioscan. 2014;9(4):1545-1547.
12. Nagalakshmi S, Palanisamy D, Eswaran S, Sreenarayan VV. Influence of plastic mulching on chilli yield and economics. South Indian Hort. 2002;50:262-265.
13. Singh AK, Singh SS, Prakash V, Kumar S, Dwivedi SK. Pulses production in India: Present status, bottleneck and way forward. Journal of AgriSearch. 2015;2(2):75-83.