

Short Research Article

EFFECT OF RICE HUSK MULCHING ON GROWTH AND YIELD OF CHICKPEA (*Cicer arietinum* L.)

ABSTRACT

During the *Rabi* season of 2022–2023, a field experiment entitled "Effect of rice husk mulching on the development and productivity of chickpea (*Cicer arietinum* L.)" was conducted at the Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, located at Utlou, Bishnupur District, Manipur, in an attempt to ascertain the effects of mulching on seedling emergence and the effects of varying degrees of rice husk mulching on chickpea yield. There are 12 treatments i.e., T₁ – Control (no rice husk mulch), T₂– 10q /ha, T₃– 15q /ha, T₄– 20q/ha, T₅– 25q/ha, T₆–30q/ha, T₇–35q/ha, T₈– 40q/ha, T₉– 45q/ha, T₁₀ – 50q/ha, T₁₁ with 55 q/ha and T₁₂ with 60 q/ha of rice husk mulching, replicated thrice in a *Randomized Block Design*. The chickpea crop's germination rate was significantly impacted by treatment T₁₂, which involved mulching 60q/ha of rice husk. Additionally, the results indicate that the treatment T₁₂– 60q/ha of rice husk mulching had significantly highest growth and grain yield (17.10 q/ha) as compared to other treatments. Thus, from the experiment it can be concluded that *the* application of rice husk (60q/ha) mulching *are* *is* more favorable for attaining sustainable higher profits and productivity in the cultivation of chickpea during *Rabi* season of Manipur.

Keywords: (Chickpea, mulching, growth, yield, economics.)

1. INTRODUCTION

Pulses, the grain seed of legumes are an important group of crops in India. The world's biggest producer of pulses is India. About 7–10% of India's 315.72 million tons of food grains produced in 2020–2021 were from pulses (Ministry of Agriculture & Farmers Welfare, Government of India, 2022). In Manipur the total production of chickpea was 1.8 m t⁻¹ and under area 0.7 m ha⁻¹. In 2014–2015, the chickpea yield was 838 kg/ha (Anonymous, 2016). Pulse crop production improves soil health, encourages sustainable agriculture, while utilizing water efficiently. According to estimates, 80% among the biologically fixed nitrogen utilized in agriculture is fixed by Leguminous agricultural plants and the microorganisms that inhabit their root nodules have a symbiotic connection. (Burns and Hardy, 1975).

The chickpea (*Cicer arietinum* L.), sometimes referred to as bengal gram or garbanzo beans, is a winter crop that belongs to the Papilionaceae subfamily of the Leguminosae family. The origin of the chickpea has been identified to southeast Turkey. In addition to a secondary center that origin in Ethiopia, four centers of diversity emerged across the Arabian Peninsula, the eastern Mediterranean, Central Asia, & India (Vavilov, 1951). Desi, also

called brown gram (*Cicer arietinum* L.), and Kabuli, sometimes called white gram (*Cicerkabulinum*), are the two types of Indian gram.

The word "molsch," ~~that-which~~ is German for "soft to decay," is where the word mulch originates. Mulch is the term used to describe the spread that gardeners make over the ground using straw and leaves (Jacks et al., 1955). It has several applications in agriculture. The main goals of mulch, especially in dry and semi-arid areas, are water saving and erosion control. Other uses for mulching include adjusting soil temperature, controlling weeds, conserving soil, and adding nutrients for plants after decomposition of organic mulch, improve soil structure, increases crop quality and yield. In this present experiment, rice husk is used as the mulching material which is cheaper and easily available in Manipur. In India, many researchers had researched on chickpea on better agronomic methods and nutrient management. However, mulching in chickpeas has not been thoroughly studied or investigated. Consequently, in light of this, the current experiment named "Effect of rice husk mulching on growth and yield of chickpea (*Cicer arietinum* L.)" was undertaken.

2. MATERIAL AND METHODS

The field experiment was conducted at the experimental site of the Pandit Deen Dayal Upadhyay Institute, Agricultural Sciences situated in Utlou, Bishnupur District, Manipur, during the *rabi* season of 2022–2023 which is at 24°43'23"N latitude & 93°51'33"E longitude and situated near the elevation of 790 meters above mean sea level (MSL). The soil of the experimental site had a pH of 5.2, was clayey, medium fertility. The soil's chemical composition revealed that it had high organic carbon content (1.04%), medium levels of phosphorus (254 kg ha⁻¹) as well as potassium (38.47 kg ha⁻¹) and moderate available nitrogen (296.81 kg ha⁻¹). The surroundings were somewhat conducive to the formation and growth of chickpea with total rainfall of 200.7 mm during the cropping period. There are twelve treatments and three replications laid out in the Randomized Block Design (RBD). The treatments were: T₁ (control, no rice husk mulch), T₂ (10q/ha), T₃ (15q/ha), T₄ (20q/ha), T₅ (25q/ha), T₆ (30q/ha), T₇ (35q/ha), T₈ (40q/ha), T₉ (45q/ha), T₁₀ (50q/ha), T₁₁ (55q/ha), and T₁₂ (60q/ha) mulching with rice husk respectively. A consistent dosage of 25 kg N per hectare (urea), 50 kg P₂O₅ per hectare (single super phosphate), and 20 kg K₂O per hectare (muriate of potash) were applied to all treatments including control on the day of sowing. The biometric observations on different characteristics *viz.*, germination percentage, plant height, No. of branches were recorded at various crop growth period. The grain yield (kg/ha) was also recorded from each net plot at harvest. Mean values of data obtained from the experiment are computed for statistical analysis to test significance and interpretation of results. The statistical significance of various affects was tested 5% level of probability (Gomez and Gomez, 1984).

3. RESULTS AND DISCUSSION

3.1 Effect of rice husk mulching on germination percentage.

Table 1 demonstrates the germination percentage as influenced by rice husk mulching in chickpea crop on the seventh and fourteenth days after sowing. Between treatments, rice husk mulching had no significant effect on the germination percentage on the seventh day. However, treatment T₁₂ with 60q/ha of rice husk mulching had significantly highest germination percentage (88.33%) on the fourteenth day, and T₁₂ is par with T₁₁ and T₁₀, T₉ with T₈, and T₆ with T₅, T₄ and T₃. However, in the absence of rice husk mulching, significantly lower germination percentage (79.08%) was recorded in control (T₁). The majority of the highest germination noted in mulched condition might be because of more

Comment [U1]: The section on mulching is informative but lacks a smooth transition to the research gap and study objectives. Adding a connecting sentence to bridge the general benefits of mulching and the specific focus of your experiment will improve readability.

Comment [U2]: The methodology is well-detailed and provides precise information on the experimental setup.

ambient soil temperature, optimal soil moisture content and reduction in soil compaction around the seeds under mulch, which helps in better germination and emergence of the chickpea plant. Similar results under mulch were also found to be in agreement with Ramakrishnan *et al.* (2006), Thakur *et al.* (2020), Abonmaiet *al.* (2023).

3.2 Effect of rice husk mulching on plant height.

The height of the chickpea plant was greatly impacted by mulching with rice husk throughout the growing period as presented in table 1. At 30 DAS, among all treatments T₁₂ with 60q/ha rice husk mulching produced significantly taller plant (8.67cm) over other treatments. Here T₉ is at par with T₈ and T₇, T₆ with T₅ and T₄ is at par with T₃. Again at 60 DAS, T₁₂ with 60q/ha rice husk mulching produced significantly taller plant (22.33cm) over other treatments and T₈ is at par with T₇ and T₆ and T₄ is at par with T₃. Additionally, it was discovered that the plant height had significant impact at harvest and 90 DAS. The highest plant heights, measuring 36.87 cm and 47.33 cm respectively, were noted from T₁₂ (60q/ha rice husk mulching). However, the shortest plant height (5.47cm, 9.60cm, 23.47cm and 37.20cm respectively) was observed in T₁ (no rice husk mulching) throughout the growing period. The higher plant height might be due to more soil water content that was preserved, inhibited the development of weeds, which, in contrast to the control, decreased competition and soil nutrient loss. The outcomes are consistent with the conclusions of Hidayat *et al.* (2019) and Yadav *et al.* (2006). Soil moisture over time retention, improved soil fertility, increased soil temperature, and decreased leaching losses are all made possible by mulches. The findings were also consistent with those of Arche *et al.* (2022), Daleshwaret *al.* (2017).

3.3 Effect of rice husk mulching on number of branches.

The data on the number of branches was influenced significantly by the rice husk mulching as shown in Table 1. At 30 DAS, significantly maximum number of branches (2.53) was recorded in T₁₂ with 60q/ha rice husk mulching over other treatments while, T₆, T₅ and T₄ were found to be at par with each other and T₃ is at par with T₂. Similarly at 60 DAS, T₁₂ with 60q/ha rice husk mulching was recorded with significantly maximum number of branches (4.27) over other treatments. Here T₇ is at par with T₆, T₅ and T₄. However, minimum number of branches (1.20 and 2.37 respectively) was recorded in T₁ with no rice husk mulching. This might be because of the optimal soil moisture content and nutrients, which contribute to a more favourable soil environment for crop growth resulting in a greater quantity of branches on each plant. In the treatment without mulching (T₁), the fewest branches were noted. According to similar findings, Arche *et al.* (2022) & Daleshwaret *al.* (2017) who revealed that more branches were produced by mulched plant than that of no mulched plant (control).

3.4 Effect of rice husk mulching on grain yield.

From the table 1 it can be observed that the mean grain yield was influenced significantly by different treatments of mulching. Among the different treatments, T₁₂ with 60q/ha rice husk mulching was significantly recorded the highest grain yield (17.10q/ha) while T₉ is at par with T₈, T₇ with T₆ and T₄ is at par with T₃. However, T₁ without rice husk mulching showed a noticeably reduced grain production (8.83q/ha). The increased grain yield may be the result of better soil moisture conservation from increased infiltration. This improves soil moisture retention, which promotes ideal photosynthesis, nutrient absorption, and transpiration. Additionally, it prevents weeds from growing, which enhances crop development and growth. The outcomes is supported by the findings of Sajid *et al.* (2013), they discovered that by decreasing weed development, increasing soil temperature, and maintaining soil moisture, the use of organic mulches increased chickpea grain output. Additionally, the outcomes matched those of Teameet *al.* (2017) & Abonmaiet *al.* (2023).

Comment [U3]: The sections are well-organized into subheadings (germination percentage, plant height, number of branches, and grain yield), making the findings easy to follow.

Comment [U4]: Ensure that all numerical values include proper units, such as "cm" for plant height or "q/ha" for yield, to maintain clarity.

Comment [U5]: Briefly address potential limitations of the study (e.g., site-specific conditions, absence of economic analysis) to provide a balanced discussion.

Table 1. Effect of rice husk mulching on germination percentage, plant height, number of branches and grain yield.

Treatment	Germination percentage (%)		Plant height (cm)				Number of branches		Grain yield (q/ha)
	7 th day	14 th day	30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	
T ₁	46.00	79.08	5.47	9.60	23.47	37.20	1.20	2.37	8.83
T ₂	46.67	80.08	5.80	12.10	24.00	38.20	1.33	2.67	10.67
T ₃	46.58	81.25	6.27	13.80	25.33	39.30	1.40	2.87	11.50
T ₄	46.08	82.08	6.40	14.00	26.00	39.83	1.53	3.13	12.23
T ₅	47.33	82.50	6.73	14.40	26.80	40.67	1.60	3.17	12.43
T ₆	46.25	83.00	6.90	15.20	28.00	42.60	1.63	3.20	13.43
T ₇	47.83	83.75	7.17	15.53	28.47	42.93	1.77	3.23	13.73
T ₈	46.33	84.42	7.20	15.80	28.93	43.20	1.93	3.43	14.97
T ₉	46.75	85.00	7.33	16.90	30.13	44.53	2.10	3.63	15.23
T ₁₀	48.17	86.25	7.60	17.97	32.87	45.33	2.27	3.83	16.00
T ₁₁	47.00	87.00	8.07	18.80	35.47	46.57	2.40	4.07	16.63
T ₁₂	51.17	88.33	8.67	22.33	36.87	47.33	2.53	4.27	17.10
SEm±	3.77	0.34	0.08	0.12	0.18	0.14	0.04	0.05	0.15
CD (P=0.05)	NS	0.98	0.24	0.34	0.53	0.41	0.10	0.14	0.44

4. CONCLUSION

In light of this experiment's findings, it may be claimed that using rice husk mulch ~~significantly improved~~~~encouraged~~ chickpea growth and enhance the grain yield. Significantly higher grain yield of 17.10 q/ha with better growth could be obtained from 60q/ha of rice husk mulching in chickpea plant. The ~~improved growth and~~ higher yield under mulch treatment might be because of the fact that organic mulches helps to preserve soil moisture, raise soil warmth, and have a positive impact on weed control. These findings underscore the potential of organic mulching as a sustainable agricultural practice for enhancing chickpea production.

REFERENCES

- Abonmai, T., Devi, K.M., Arche, A.A., and Singh, M.S. (2023). Effect of rice husk mulching on growth and yield of local variety pea (*Makhyatmubi*) *Pisumsativum* L. *Ecology Environment & Conservation* 29 (January Supplementary Issue), pp. (S347-S350).
- Anonymous. (2016). Annual Report of promotion of Pulses in NEH Region. 2015-2016, CS Praharaj (ed), ICAR- Indian Institute of Pluses Research, Kanpur, Uttar Pradesh 208024 (India). 56pp.
- Arche, A.A., Abonmai, T., Devi, K.M. and Singh, M.S. (2022). Effect of rice husk mulching on growth and yield of local variety pea (*Makhyatmubi*) *Pisumsativum* L. *The Pharma Innovation Journal*, 11(7): 1302-1304.
- Burn, R.C. and Hardy, R.W.F. (1975) Nitrogen fixation in bacteria and higher plants. Berlin, Germany: Springer-Verlang.
- Daleshwar, R. and Prasad, P. (2017). Effect of mulches on growth and yield of chickpea (*Cicer arietinum* L.). *International Journal of Current Microbiology and Applied Sciences*, 6(7): 3893-3897.
- Gomez, K.A. and Gomez, A.A. (1984). *Statistical Procedures for Agricultural Research*. 2ndedn. Wiley, New York, pp. 101-107
- Hidayat, T., Koesmaryono, Y. and Ghulamahdi, M. (2019). Intensifying of reflected radiation under oil palm canopy and its effect on growth and production of soybean. In *IOP Conference Series: Earth and Environmental Science* (Vol. 365, No. 1, p. 012001). IOP Publishing.
- Jacks, C.V., Brind, W.D., and Smith, R. (1955). Mulching technology comm., No.49, common wealth. *Bulletin of Soil Science*, P.118.
- Ramakrishnan, A., Tam, H.M., Wani, S.P. & Long T.D. (2006). Effect of mulch on soil temperature, moisture, weed infestation and yield of groundnut in northern Vietnam. *Field Crops Research*, 95(2-3): 115-125.
- Sajid, M., Hussain, I., Khan, I. A., Rab, A., Jan, I., Wahid, F., and Shah, S. (2013). Influence of organic mulches on growth and yield components of pea's cultivars. *Greener journal of Agricultural Science*. 3: 652-657.
- Teame, G., Tsegay, A. and Abrha, B. (2017). Effect of organic mulching on soil moisture, yield, and yield contributing components of sesame (*Sesamum indicum* L.). *International Journal of Agronomy*.
- Thakur, S., Cahuhan, R.P. and Singh, O.P. (2020). Effect of different mulching materials on growth and yield of okra (*Abelmoschus esculentus* L.). *Institute of Agriculture and Animal Sciences*. 36: 197-205.
- Vavilov N.I. 1951. The origin, variation immunity and breeding of cultivated plants. *Chronica Botanica*. New York 13-1/ 6:26-38, 75-78 15 (1949-50).
- Yadav, R.D., Pareek, R.G. and Yadav, R.L. (2006). Effect of mulching and sulphur on growth and yield of mustard, *Brassica juncea* (L.) Czern and Cosson under varying levels of irrigation. *Journal of Oilseed Research*. 23(2): 219-221.