E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2024; 7(4): 262-264
Received: 05-02-2024
Accepted: 10-03-2024

Chandar K
Agricultural College, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Neelima P
Agricultural College, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Murthy KGK
Agricultural College, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Reddy IVS
Agricultural College, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Naganjali K
Agricultural College, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Pavani T
Agricultural College, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Deepak Reddy B
Agricultural College, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Corresponding Author:
Chandar K
Agricultural College, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Effect of paddy stubble powder on germination percentage and growth of chilli seedlings under poly tunnel condition

Chandar K, Neelima P, Murthy KGK, Reddy IVS, Naganjali K, Pavani T and Deepak Reddy B

DOI: https://doi.org/10.33545/2618060X.2024.v7.i4d.548

Abstract
An experiment was conducted to study the effect of paddy stubble powder on chilli germination percentage and growth and development of seedlings under poly tunnel conditions at Agricultural College, Aswaraopet, Professor Jayashankar Telangana State Agricultural University, in 2024. The experiment consisted of (12) twelve treatments laid out in a (CRD) completely randomized design replicated thrice. The treatments comprised of Paddy stubble (PS) powder (T_1), Cocopeat (T_2), FYM (T_3), Vermicompost (T_4), PS Powder + Vermicompost (90:10) (T_5), PS Powder + cocopeat (50:50) (T_6), PS Powder + Perlite (90:10) (T_7), PS Powder + Biocontrol agents (90:10) (T_8), PS Powder + BA + vermiculite + perlite (80:10:05:05) (T_9), PS Powder + FYM + Biocontrol agents (80:10:10) (T_{10}), PS powder + FYM + cocopeat (80:10:10) (T_{11}) and Vermiculite (T_{12}). Among various treatments, the highest germination %, root, and shoot length were recorded with the treatment combination of PS Powder + BA + vermiculite + perlite (80:10:05:05) (T_9) which was significantly superior to all other growing media.

Keywords: Paddy stubble powder, vermicompost, FYM, perlite, vermiculite, growing medium, and seedling growth

Introduction
Rice (*Oryza sativa*) is the main staple food of the Asian countries. In 2021, annual world rice production was 800 million tonnes, and 92.48% were from Asian countries. Although rice is the world's second-largest cereal crop after wheat, stubble burning has been considered among the major contributors to air pollution especially in South Asia. It is a significant source of gaseous pollutants like carbon dioxide (CO_2), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur oxides (SO_x), and methane (CH_4) as well as particulate matter(PM_{10} and $PM_{2.5}$) causing serious damage to the human health and environment.it is recorded that the burning of 1 tonne of crop stubble releases 1460 kg of carbon dioxide (CO_2), 199 kg of ash, 60 kg carbon monoxide (CO),3 kg of particulate matter (PM_{10} and $PM_{2.5}$), and 2 kg sulfur dioxide (SO_2) into the atmosphere. The situation is more austere in India due to the intensive rice-wheat rotation system which generates a large amount of stubble. It was estimated that about 352 million tonnes (Mt) of stubble are generated each year in India out of which 22-30% and 34-46% are contributed by wheat and rice stubble respectively. About 84-90 Mt (23.86-27.45%) of the stubble is burnt on-field each year immediately after harvest. The disastrous haze observed over India during the winter season has been linked to stubble burning as it coincides with, the burning periods (October-November). During this time, most Indian cities, especially within the National Capital Region (NCR) experience harsh pollution often reaching severe levels of the air quality index (AQI). The health effects of air pollution range from skin and eye irritation to severe neurological, cardiovascular, and respiratory diseases, asthma, chronic obstructive pulmonary disease (COPD), bronchitis, lung capacity loss, emphysema, cancer, etc. It also leads to an increase in mortality rates due to prolonged exposure to high pollution. In addition to its effects on air quality, stubble burning also affects soil fertility (through the destruction of its nutrients), economic development, and climate.

The crop stubbles (if managed properly) could provide immense economic benefits to the farmers and protect the environment from severe pollution. Some of the alternative management practices include the incorporation of stubble into the soil, use of stubble as fuel in power plants, use as raw material for pulp and paper industries, or as biomass for biofuel production. It can also be used to generate compost and biochar or as a blend for the production of cement and bricks. nowadays chilli and other crops seedlings are raised in nurseries for commercial purposes and it is sustainable employment for unemployed people, day by day the cocopeat, vermicompost, vermiculite, and perlite (Media) costs shoot up and the paddy stubble powder is an alternate source of media to reduce the cost for the raising of the seedlings in the nursery industry, in this experiment, we integrated various growing media along with paddy stubble powder, and various parameters were analyzed.

Materials and Methods

The experiment was conducted at Agricultural College, Aswaraopet, Professor Jayashankar Telangana State Agricultural University, Telangana State, in January to march 2024. The experiment was planned in a completely randomized design with three repetitions consisting of 12 treatments in a polytunnel; which included paddy (PS) powder (T_1), cocopeat (T_2), FYM (T_3), vermicompost (T_4), PS Powder + Vermicompost (90:10) (T_5), PS Powder + cocopeat (50:50) (T_6), PS Powder + Perlite (90:10) (T_7), PS Powder + Biocontrol agents (90:10) (T_8), PS Powder +BA+ vermiculite + perlite (80:10:05:05) (T_9), PS Powder + FYM + Biocontrol agents (80:10:10) (T_{10}), PS powder + FYM + cocopeat (80:10:10) (T_{11}) and Vermiculite (T_{12}). Chilli seeds (VNR-314) were sown on 22nd January 2024 in protrays using a seed rate of 1.5 kg ha^{-1}. Observations of germination %, root length, and shoot length were taken at 15-day intervals up to 45 days.

Fig 1: PS Powder +BA+ vermiculite+ perlite (80:10:05:05) media filled in portrays

Germination %: The ratio of No. of seeds germinated to that of No. of seeds sown and is calculated by using the formula

$$G\% = \frac{\text{No. of seeds germinated}}{\text{No. of seeds sown}} \times 100$$

Results and Discussion

Table 1: Effects of different growing media on Germination %, root length and shoot length of chili seedlings

Treatment details	Germination %	Root length (cm)			Shoot length (cm)		
		15 DAS	30 DAS	45 DAS	15 DAS	30 DAS	45 DAS
T_1	57	3.53	7.51	8.38	3.93	7.73	11.94
T_2	62	4.22	7.54	8.60	4.06	8.89	12.36
T_3	64	4.69	7.57	8.94	4.54	11.02	13.84
T_4	73	5.63	7.87	9.54	4.61	12.20	15.53
T_5	79	7.04	8.68	10.40	6.38	14.07	19.57
T_6	79	5.76	8.22	9.82	4.92	12.33	16.71
T_7	70	5.77	8.23	9.87	5.12	12.63	17.35
T_8	76	6.04	8.37	10.23	5.37	12.71	18.16
T_9	95	10.48	10.81	15.00	8.64	14.69	24.78
T_{10}	85	8.05	9.81	12.49	7.45	14.40	21.98
T_{11}	84	7.56	9.54	11.45	7.23	14.21	19.89
T_{12}	71	5.42	7.66	9.23	4.52	11.44	15.27
S.Em ±	1.68	0.72	0.09	0.82	0.70	1.07	1.07
CD	5.12	2.11	0.29	2.42	2.05	3.14	3.14

Data presented in Table 1. represented the germination % when observed after one week of sowing revealed that the highest germination % was recorded with T_9 - PS Powder + BA + vermiculite + perlite (80:10:05:05) which was significantly superior over all other media and this was followed by PS Powder+ FYM+ Biocontrol agents (80:10:10) (T_{10}), and PS powder + FYM + cocopeat (80:10:10) (T_{11}) which were on par with one another.

Root length and shoot length observations were taken at 15 days intervals up to 45 days and at all the stages it was observed that the highest root and shoot length was recorded with T_9 - PS Powder + BA + vermiculite + perlite (80:10:05:05) which was significantly superior over all other media and this was followed by PS Powder+ FYM+ Biocontrol agents (80:10:10) (T_{10}), PS powder + FYM + cocopeat (80:10:10) (T_{11}) which were on par with each other and the least was noticed with 100% paddy straw powder media due to the late decomposition of the straw when added directly. These results are in accordance with the findings of Sukumaran *et al*., 2010 [8].

Fig 2: Root and shoot length of chili seedlings grown in different media

Conclusion

Stubble burning affects air quality, soil fertility agricultural productivity, increases mortality rates, human health and well-being, and economic development, and ultimately hurts climate change and general well-being either straightly or discursively. Paddy stubble burning has been identified as a major environmental and health hazard in Punjab. It is extremely important to understand the underlying causes and the existing situations as to why the farmers burn stubble and then deal with the basic problem. Most of the farmers are left with few options but to burn the paddy stubble due to lack of limited time for the next crop to prepare the field for wheat cultivation, cheaper as compared to the other practices, requires less effort, labor shortage during the harvesting period, considering the adverse effects of paddy stubble burning on the environment, attentive efforts can be made by utilizing this stubbles powder as growing media in the nursery industries by collecting and chopping paddy stubbles. Further, this media was integrated with different biocontrol agents, FYM, vermiculite, and perlite gave better results. These powdered stubbles can be used for improving soil health, increasing crop productivity, reducing pollution, and enhancing the sustainability and resilience of agriculture

References

1. Anonymous; c2021. http://www.foa.org
2. Emtenan M, Hanafi HHE, Khadrawy WM, Ahmed MM. Some observations on rice straw with emphasis on updates of its management. World Appl Sci J. 2012;16(3):354-361.
3. Gadde B, Menke C, Wassmann R. Rice straw as a renewable energy source in India, Thailand, and the Philippines: Overall potential and limitations for energy contribution and greenhouse gas mitigation. Biomass Bioenergy. 2009;33(11):1532-1146.
4. Kadam KL, Forrest LH, Jacobson WA. Rice straw as a lignocellulosic resource: collection, processing, transportation, and environmental aspects. Biomass Bioenergy. 2001;18:369-389.
5. Mandeep, J Pranay, Sitaram, Reshu, Davinder P. Impact of stubble burning in Punjab - A review. Journal of Pharmacognosy and Phytochemistry. 2020;SP6:245-250
6. Robinson P. University of California Davis, personal communication; c2006.
7. Singh R, Monika S, Ashish S. Environmental sustainability of bioethanol production from rice straw in India: A review. Renewable and Sustainable Energy Reviews. 2016;54:202-216.
8. Sukumaran RK, Surender VJ, Sindhu R, Binod P, Janu KU, Sajna KV, et al. Lignocellulosic ethanol in India: Prospects, challenges and feedstock availability. Bioresource Technol. 2010;101:4826-4833.
9. UNEP. Converting waste agricultural biomass into energy sources. Osaka, Japan: Division of Technology, Industry and Economics; c2009.