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Effect of smoke on quality parameters based on germination and post germination response on smoke treated pulses

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Abstract
The studies on the effect of smoke on germination and post germination response on seed quality parameters of treated green gram seeds was conducted under Completely Randomized block Design (CRD). The experiments conducted resulted in no adverse effect on germination percent, rather the treatment of pulse seeds at different exposure to smoke enhanced the germination percentage. The treatment of green gram seeds with neem seed cake (97 to 100%) was most effective followed by Mustard seed cake (95-99%), Karanj seed cake, cow dung cake and wheat husk smoke at 120 h of smoke exposure. Similarly, the germination index, root length, shoot length, vigor index and significance of variability was also found more in smoke treated pulse seeds in comparison to untreated control which clearly showed positive effect of smoke on germination and post-germination response of pulse seeds. Hence, it may be concluded that these eco-friendly and cost-effective products can easily be made available and used as seed treatment stored pulses without impairing the quality of seeds for 3 months of storage period.

Keywords: Green gram, quality parameters, smoke, stored pulses

Introduction
Pulses are defined by the FAO as legumes harvested solely for their seed which is consumed directly. Pulses are a good source of vegetable protein catering to the needs of 44 mostly vegetarian population (Mohapatra *et al.*, 2018). Pulses and cereal grains have similar total carbohydrate, fat, niacin, riboflavin, thiamine and vitamin B6 contents. However, pulses have higher protein, folate, iron, magnesium, potassium, and zinc content than cereals (Singh, 2017) [18]. The per capita availability of pulses is@ 42g per day. Hence, there is an urgent need for increasing the pulses production to meet the growing demand for consumption (Ramazeame, 2014) [16]. The extent of damage to pulse seeds is very high both qualitatively and quantitatively. About 100% loss of pulse seeds was found due to infestation by pulse beetle (Aslam *et al.*, 2002) [3]. In India, among various pulses green gram stands third and contributes 11% of the total pulse production with 1.61 million tonnes from an area of about 3.42 mha. The mung bean, alternatively known as the green gram, mash, moong, monggo or munggo is a plant species in the legume family India (Manju *et al*., 2019) [12]. Among the grain legumes, green gram[Vigna radiate (L.) Wilczek], commonly known as 'Moong or mung bean is an excellent source of high quality protein. It contains about 25% protein of high digestibility (Kundu *et al.*, 2013) [11]. The average yield of green gram is 512kg/ha (Soumia *et al.*, 2015) [21]. Plant and animal origin products such as cow urine and cow dung ash powder, Panchgavya, Bijamrit and cow dung smoke, neem leaves smoke, karanj seed cake smoke etc. were also evaluated as an eco-friendly management tools for stored insect pests (Arya and Tiwari, 2013) [2]. Quantify the possible effect of smoke generated by the burning of cow dung cake on quality of seeds of stored pulse commodities under airtight conditions (Yadav and Tiwari, 2016; Kishor *et al.*, 2021) [10].

Materials and Methods
The experiments on the Effect of Smoke on germination and post germination response of smo ke treated pulse seeds were conducted during 2020- 2021 in the department of entomology, Sam Higginbottom University of Agriculture Technology And Sciences, Prayagraj, Dist. Nain Uttar Pradesh. Current experiment conducted using Complete Randomized Design (CRD) with three replications. The green gram seeds were treated with smoke with the help of smoker.

Methodology

The pulse seeds were kept in conical flasks treated with various smokes separately for different exposure time periods under airtight conditions. Then the disinfected smoke treated pulse grains were transferred in an air tight 1kg plastic jar, separately and was stored for 3 months under air- tight conditions. After the storage of treated pulse seeds for 3 months Germination Assay test was done separately for all treated green gram seeds as mentioned above. The seed germination test was carried out by employing rolled paper towel test according to International rules of Seed Testing (Anonymous, 1985). Twenty seeds of all treated pulse commodities were taken and placed on a wet paper towel and then again the seeds were covered with wet paper towel and then towel was rolled and kept in tray in slanting position for 7-8 days. The moisture content was being maintained by spraying water regularly on the rolled paper towel. The germinated seeds were then counted after 7-8 days and length of roots and shoots were measured along with the calculation of vigour index and significance of variability. Th en, seed germination percentage, ge

germination index, vigour index was calculated and seedling root and shoot length were also measured. Germination index was calculated using formula designed by (ISTA, 2010) and seedling vigour index was calculated by using equation designed by (Abdulbaki and Anderson, 1973; Iqbal *et al.*, 2016) [1, 8].

Results and Discussions

Germination (%):- The germination percentage of treated green gram seeds were observed to be highest when treated with neem seed cake smoke ranging between 86.52 to 100% after smoke exposure of 1, 12, 24, 48, 72, 96,and 120h followed by karanj seed cake ranging between 86.52% to 99.60% and when treated with mustard seed cake it ranged between 86.52% to 99.27% along with germination % ranging between 86.52% to 90.17% when treated with cow dung cake smoke and when treated with wheat husk smoke it ranged between 86.52 to 97.67%.

Germination index: The germination index of treated green gram seeds were observed to be highest when treated with karanj seed cake and mustard seed cake ranging between 2.87 to 3.32 followed by neem seed cake smoke ranging between 2.87 to 3.27 along with germination index ranging between 2.87 to 3.00 when treated with cow dung cake smoke and when treated with wheat husk smoke it ranged between 2.87 to 3.21.

Root length

The highest root length was observed when seeds were treated with mustard seed cake for 120 hours of smoke exposure and it was 8.03cm followed by karanj seed cake (7.58cm), wheat husk smoke (6.60 cm), neem seed cake (6.51 cm) and cow dung cake (6.21 cm). Similarly root length was measured after 1, 12, 24, 48, 72and 96 h of smoke exposure.

Shoot length

Similar like root length, the shoot length was observed to be highest (19.31 cm) after120 h of smoke exposure to mustard seed cake followed by karanj seed cake (7.83 cm), wheat husk smoke (7.53 cm), neem seed cake (6.51 cm) and cow dung cake (5.61 cm). Similarly root length was measured after 1, 12, 24, 48, 72and 96 h of smoke exposure

Vigor index

The root length and shoot length along with percent germination of treated green gram seeds gave vigor index values which was found the highest after 96 and 120 h of smoke exposure and it was mustard seed cake (2472.30) followed by karanj seed cake (1535.44), neem seed cake (1383.91), wheat husk smoke (1371.17) and cow dung cake (1066.45). Similarly root length was measured after 1, 12, 24, 48, and 72 h of smoke exposure.

Significance of viability

It was observed to be ranging between 0.96 to 1.11 when treated with various smokes for 1, 12, 24, 48,72,96 and 120 h of smoke exposure

Table 1: Effect of mustard seed cake smoke on quality parameters of green gram seeds under different exposure time periods

S. No.	Exposure time (hour)	Germination (%)	Germination index	Root length (cm)	Shoot length (cm)	Vigor index	Significance of viability
1.	1	98.00	3.28	7.33	13.00	2074.85	1.15
2.	12	98.00	3.24	7.33	14.33	2111.03	1.15
3.	24	94.33	3.14	6.67	14.67	1991.32	1.07
4.	48	95.67	3.17	6.33	14.00	1971.88	1.09
5.	72	96.67	3.23	7.00	14.67	2061.28	1.13
6.	96	97.67	3.24	7.33	17.67	2472.30	1.08
7.	120	99.27	3.32	8.03	19.31	1821.97	1.11
8.	Untreated control	86.52	2.87	5.00	5.87	961.83	1.00

Table 2: Effect of Karanj seed cake smoke on quality parameters of green gram seeds under different exposure time periods

S. No.	Exposure time(hour)	Germination (%)	Germination index	Root length(cm)	Shoot length (cm)	Vigor index	Significance of viability
1.	1	97.00	3.20	5.27	7.27	1215.85	1.13
2.	12	96.67	3.22	4.80	7.33	1172.93	1.14
3.	24	97.00	3.23	5.50	7.20	1235.48	1.10
4.	48	97.00	3.23	6.20	7.10	1307.28	1.10
5.	72	97.00	3.23	5.87	7.27	1268.74	1.16
6.	96	98.00	3.26	7.40	7.27	1438.35	1.09
7.	120	99.6	3.31	7.58	7.83	1535.44	1.11
8.	Untreated control	86.52	2.87	5.00	5.87	961.83	1.00

Table 3: Effect of Cow dung cake smoke on quality parameters of green gram seeds under different exposure time periods

S. No.	Exposure time(hour)	Germination (%)	Germination index	Root length (cm)	Shoot length (cm)	Vigor index	Significance of viability
1.	1	88.33	2.88	5.65	5.79	1048.17	1.03
2.	12	87.55	2.83	5.18	4.92	879.07	1.03
3.	24	87.55	2.92	5.48	5.96	958.62	0.99
4.	48	88.00	2.92	5.15	5.73	963.85	1.00
5.	72	87.77	2.92	5.23	5.55	941.82	1.05
6.	96	86.78	2.88	5.44	5.62	1028.01	0.96
7.	120	90.17	3.00	6.21	5.61	1066.45	1.01
8.	Untreated control	86.52	2.87	5.00	5.87	961.83	1.00

Table 4: Effect of Neem seed cake smoke on quality parameters of green gram seeds under different exposure time periods

S. No.	Exposure time(hour)	Germination (%)	Germination index	Root length (cm)	Shoot length (cm)	Vigor index	Significance of viability
1.	1	100.00	3.29	5.84	6.90	1232.23	1.16
2.	12	99.00	3.29	5.43	6.90	1226.93	1.15
3.	24	95.33	3.17	5.85	7.07	1224.29	1.08
4.	48	97.00	3.23	5.77	6.63	1187.96	1.10
5.	72	97.33	3.24	5.07	6.83	1196.20	1.16
6.	96	97.00	3.23	5.67	7.10	1240.32	1.07
7.	120	98.56	3.27	6.51	7.53	1383.91	1.10
8.	Untreated control	86.52	2.87	5.00	5.87	961.83	1.00

Table 5: Effect of wheat husk smoke on quality parameters of green gram seeds under different exposure time periods

S. No.	Exposure time(hour)	Germination (%)	Germination index	Root length (cm)	Shoot length (cm)	Vigor index	Significance of viability
1.	1	95.67	3.18	5.57	6.63	1192.98	1.12
2.	12	95.00	3.16	5.63	6.67	1154.86	1.12
3.	24	94.00	3.13	5.33	6.77	1136.37	1.07
4.	48	92.33	3.07	5.10	7.17	1140.30	1.05
5.	72	92.00	3.06	5.73	6.40	1168.81	1.10
6.	96	97.67	3.25	5.60	6.37	1142.98	1.08
7.	120	96.46	3.21	6.60	7.67	1371.17	1.08
8.	Untreated control	86.52	2.87	5.00	5.87	961.83	1.00

Discussion

Staden *et al.,* 2000 [23] investigated the use of smoke as a trigger for germination in relation to specific growth, regeneration strategies etc. It ensures germination. Brown *et al.,* 2003 [4] identified the germination enhancing effect of plant derived smoke on seeds of *Fynbos* sps. Brown *et al.,* 1997 [5] identified Smoke as an important tool in management of storage pests. Sparg *et al.,* 2006 [22] evaluated the effect of smoke as a germination cue and also suggested that smoke improves vigour and highlighted the effects of aerosol smoke and smoke water on the germination and seedling vigour. Soos *et al.,* (2009) [20] studied a massive increase in post-germination growth and seedling vigour in maize with smoke. Demir *et al.,* 2012 [6] evaluated a smoke-derived butenolide has been shown to improve sedling vigour of various crop species. Iqbal *et al.,* 2016 [8] evaluated that smoke produced from burning of plant material elicited a striking increase in the germination in various plant species. Plant derived smoke has stimulatory effect on germination and post germination response in non imbibed seeds and caused inhibitory effect in imbibed seeds. Yadav and Tiwari, (2017) [24] reported the positive effect of smoke generated by burning of cow dung and neem leaves in enhancement of the seed germination with more root and shoot length of treated wheat seeds which ultimately gave high vigour index and significance of viability. Kishor *et al.,* 2021 [10] studied the effect of cow dung smoke on mortality of pulse beetle, *Callosobruchus chinensis* (Linn) and on quality parameters of stored commodities *viz*. green gram, black gram, and red gram and evaluated that the overall mean mortality of Pulse beetle on different stored pulses was increased to four times with smoke treatments at different time intervals of exposure periods.

Summary

The effect of smoke on germination and post germination response of different pulse commodities under different exposure time intervals i.e., 1, 12, 24, 48, 72, 96 and 120 h were observed under airtight conditions. The exposure of pulse seeds to different smokes doesn't have any adverse effect on germination response of pulse seeds rather it enhanced the germination percentage. Almost near to 100% germination percentage was observed in smoke treated pulses. This treatment was effective generally after 96 and 120 h of expoaure to smoke. Germination index was calculated ranging between 2.87 to 3.31 and along with root length extending upto 8.03 cm and shoot length extending upto 19.31 cm along with highest calculated vigour index of 2472.30 with significance of viability of 1.11. This clearly proved that smoke at different exposure periods was not deleterious to seed quality of pulse commodities.

Conclusions

The effect of smoke showed the positive effect of smoke treatment in enhancing the seed germination of treated seeds of green gram with more root and shoot length which ultimately gave high vigor index and significance of

variability, under different experiments conducted under airtight conditions. Based on the results of these studies it can be concluded that smoke exposure to pulse seeds for 1h to 120h can easily be done for rapid emergence, enhancing germination percentage and production of vigorous seedling. It has also been concluded that among all the plant and animal origin by-products, smoke from mustard seed cake was found to be the most effective in enhancing the germination and post germination response of treated pulse seeds. Study validated the efficacy of these plant and animal origin by-products against storage insect pests for success and sustainability of this inexpensive, healthy, easily available and ecological friendly pest control method for the small scale and resource poor farmers.

References

1. Abdul-Baki A, Anderson JD. Vigour determination in soyabean seed by multiple criteria, *Crop Science*. 1973;13:630-633.
2. Arya M, Tiwari R. Efficacy of plant and animal origin bio products against lesser grain borer, *Rhyzopertha dominica* (Fab.) in stored wheat. International Journal of Recent Scientific Research. 2013;4(5):649-653.
3. Aslam, Muhammad, Khan, Ali, Khalid, Bajwa MZH. Potency of some spices against *Callosobruchus chinensis* Linnaeus. Online Journal of Biological Sciences. 2002;2(7):449-452.
4. Brown NAC, Staden Van J, Daws MI, Jhonson T. Patterns in the seed germination response to smoke in plants from the Cape Floristic Region, South Africa. South African Journal of Botany. 2003;69(4):514-525.
5. Brown NAC, Staden Van J. Smoke as a germination cue, a review. Plant Growth regulators. 1997;22:115-124.
6. Demir I, Ozuaydin F, Yasar J, Staden Van J. Effect of smoke derived butenolide priming treatment on pepper and salvia seeds in relation to transplant quality and catalase activity. South African Journal of Biotechnology. 2012;78:83-87.
7. Faruk K, Varol I, Bayram M. The effect of carbon dioxide a high pressure under different developmental stages of *Callosobruchus maculates* (F.) hosting on chickpea. African Journal of Biotechnology. 2011;10(11): 2053-2057.
8. Iqbal M, Asif S, Ilyas NI, Hussain M, Shabir S, Faz MNA, *et al*. Effect of plant derived smoke on germination and post germination expression of wheat *(Triticum aestivum* L.). American Journal of Plant Sciences. 2016;7:806-813.
9. Jadhav DR, Mallikaarjuna N, Rao GVR. *Callosobruchus maculates* resistance in some wild relatives and interspecific derivatives of Pigeon pea. Indian Journal of Plant Protection. 2012;40:40-44.
10. Kishor, Kamal, Mahankuda, Bhabani, Tiwari, Ruchira. Effect of cow dung smoke on Pulse beetle, *Callosobruchus chinensis* (Linn.) and quality parameters of stored pulses at Pantnagar, Uttarakhand. Journal of Entomology and Zoology Studies. 2021;9(1):1288-1294.
11. Kundu, Rajib, Mandal, Jajati, Majumder, Aparajita. Growth and production potential of Green gram (*Vigna radiata*) influenced by Rhizobium inoculation with different nutrient sources. International Journal of Agriculture, Environment and Biotechnology 2013;6(3):344-350.
12. Manju K, Jayaraj J, Shanthi M. Efficacy of Botanicals Against Pulse beetle, *Callosobruchus maculates* (F.) in green gram. Indian Journal of Entomology, 2019;81(1):144-147.
13. Mohapatra, Debabandya, Kar, Abhijit, Giri, Kumar *et al*. Insect Pest Management in Stored Pulses: an Overview. Food and Bioprocess Technology. 2015;8(2):239-265.
14. Rahman A, Talukder FA. Bio efficacy of some plant derivatives that protects grains against the pulse beetle, Callosobruchus maculates. Journal of Insect Sciences, 2006;6:19-25.
15. Raja M, John S.
Impact of volatile oils of plants against the cowpea beetle , *Callosobruchus maculates* (Fab.) (Coleoptera: Bruchidae). International Journal of Integrative Biology. 2008;2(1):62-64.
16. Ramazeame L, Adiroubane D, Govindan K, Jagatheeswari J. Management of pulse beetle, *Callosobruchus chinensis* Linn. Using botanicals. Journal of Entomology and Zoology Studies. 2014;2(4):299-303.
17. Sagheer M, Hasan M, Ali Z, Yasir M, Ali K, Khan FZA. Evaluation of essential oils of different citrus species against *Trogoderma granarium*(Everts.) (Coleoptera: Dermestidae) collected from vehari and Faisalabad districts of Punjab, Pakistan. Pakistan Entomologist. 2013;35:37-41
18. Singh, Narpinder. Pulses: an overview. Journal of Food Science Technology. 2017;54(4):853-857.
19. Singh VN, Pandey ND. Growth and development of *Callosobruchus chinensis* L. on different gram varieties. Indian Journal of Entomology. 2001;63:182-185.
20. Soos V, Sebestyen E, Juhasz A, Pinter J, Light ME, Van Staden J *et al*. Stress- related genes define essential steps in the response of maize seedlings to smoke- water. Functional Integrating Genetics. 2009;9:231-242.
21. Soumia PS, Srivastava, Chitra, Dikshit HK, Pandi Pirasanna, Guru G. Screening for Resistance against pulse beetle, *Callosobruchus analis* (F.) in green gram (*Vigna radiata* (L.) Wilczek) accessions. Proceedings of the National Academy of Sciences, India section B: Biological Sciences. 2015;90(2):261-265.
22. Sparg SG, Kulkarni MG, Van Staden J. Aerosol- smoke and smoke water stimulation of seedling vigor of a commercial maize cultivar. Crop Science. 2006;46:1336-1340.
23. Staden, Van J, Brown NAC, Jager AK, Jhonson TA. Smoke as a germination cue. Plant species Biology. 2000;15:167-178.
24. Yadav, Usha, Tiwari, Ruchira. Eco- friendly management of *Sitophilus oryzae* and *Rhyzopertha dominica* in stored wheat at Pantnagar, Uttarakhand. Journal of Applied and Natural Sciences. 2017;9(2):736-743.