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Effect of rice husk ash on controlling insects pests on storage of soybean seeds under Manipur condition

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Abstract
An experiment was conducted in the experimental laboratory of Agronomy Department, College of Agriculture, Central Agricultural University, Imphal, in 2013 to 2016, to study the "Effect of rice husk ash on controlling insects pests on storage of soybean seeds" (*Glycine max* L. Merril) in Manipur condition. It was found that when we mixed the rice husk ash with soybean seeds and stored in the ratio soybean: rice husk 1: 0.25 and above and there was no loss from the insect pests. In control i.e. T1(grains without rice husk ash) was found 100% damage in one year.

Keywords: Soybean seeds, rice husk ash, insects pests

Introduction
Since time immemorial, soybean has served as meat, milk, cheese, bread as well as oil for the people of China and East Asia, and the ancient literature of those countries called it as" Gold from soil" (Horvath, 1926) [1]. The crop Soybean, *Glycine max* L. Merril, belonging to family Leguminosae/Fabaceae also known as "Miracle crop" because of its inherent diversified properties both as medicinal and high nutritional value crop with its about 40% protein, 20% oil, 35% carbohydrate and 5% ash contents has been identified as an excellent, versatile plant bio-resource that can yield a high value added commodity in just 100-120 days. It can also be further termed as a valuable "Gift of Mother Nature" to human beings as it is the richest source of Isoflavones, the nature healing hormone. Soybean is also graded as superior pulse known as "Golden Bean" (Khader, 2019) [3]. All soy foods including soymilk are high in protein, low in fat and contain no cholesterol.

Storage of pulse is one of the important links in the entire pulse production and its utilization chain. Proper storage of pulses facilitates the farmers to overcome the shortage in lean season and serves as a means of ensuring crop in the subsequent season. It is also utilized by farmers as a profit maximization mechanism by avoiding distress sale at the time of harvest. In India, about 70% of farm produce is stored by farmers for their own consumption using different types of storage structures made from locally available materials (Shukla and Pati, 1998) [7]. Farmers of Karvi block in Chitrakoot district practiced mixing of fine husk of wheat collected during the threshing of wheat with chickpea seeds/grains at the rate 2kg per 50 kg of seeds (Sah *et al*., 2014) [6]. The dried pulse grains are heated by mixing wood ash/cow dung ash/sand stored in a new earthen pot to suppress the pest infestation growth during storage (Reddy, 2005) [5]. Dust, such as silica gel or diatomaceous earth, can be combined with certain stored grains to provide protection against insect damage (Rajasri and Kavitha, 2015) [4]. In Manipur, area under soybean is around 5,200ha with a production figure of 4,510 tons. Postharvest losses are very high in India which accounts for 33-35% reduction in pulse production as compared to developed countries. Out of which, up to 32.7% is from storage loss alone as compared to only 5%in that of developed countries (Singh, 2017) [8]. In Manipur, majority of the farmers are small and marginal farmers. So, storing of grains after their harvest has always been a problem for farmers as the stored grains are found to be often infested with insect pests. As a result small and marginal farmers who grow soybean are unable to store their produce feeds and are forced to sell their seeds at a lower price. Seeds kept for sowing for the next season are also infested and hence, cannot be used for sowing thereafter.

The insect pests directly feeds on the stored grains and other stout beetles lay their eggs on the maturing pods in the field or in the stored grains. The larvae thus developed from the eggs bore and feed on the grains, thereby reducing the quality of the produce, if we do not use any synthetic or organic pesticides. Now- a- days, with the popularization of organic farming in the state of Manipur, the farmers are willing to explore and adopt more organic solutions in their fields.

Considering the above figure losses due to improper storage, an experiment was conducted at College of Agriculture, Central Agricultural University, Iroisemba, Imphal, from the year 2013 to 2016 to bring about a suitable storage method to minimize the storage losses in soybean which includes the utilization of ash of rice husk.

Methodology

Soybean seeds were collected from the farmers and cleaned properly. The seeds were spread thinly on a concrete floor under the sun for 5 days. It was then cooled and stored in polythene bags. The seeds were then mixed well with rice husk ash at different proportions as T1 [1kg soybean seeds (control without rice husk ash)], T2 (1kg soybean seeds+100g rice husk ash), T3 (1kg soybean seeds+ 150g rice husk ash), T4 (1kg soybean seeds+200g rice husk ash), T5 (1kg soybean seeds+ 250g rice husk ash), T6 (1kg soybean seeds+ 300g rice husk ash), T7 (1kg soybean seeds + 350 g rice husk ash), T8(1kg soybean seeds + 400 g rice husk ash), T9(1kg soybean seeds + 450 g rice husk ash) and T10 (1kg soybean seeds + 500 g rice husk ash) and then stored with the ends of the bags tied. Each treatment consists of five replications. The upper most layer of each treatment was covered with a layer of rice husk ash, and were placed on a plank in the laboratory for a year. The stored grains were monitored and damage percentage was recorded for each consecutive year i.e., from 2013 to 2016.

Result and Discussion

It was observed that there was no damage of soybean seeds by insect pests in the treatment T5 to T10 i.e., when the grains were mixed with the rice husk ash at the ratio as 1:0.25, 1:0.30, 1:0.35, 1:0.40, 1:0.45, and 1:0.50 (table no.1).

Table 1: Effect of rice husk ash on 1 year storage of soybean (2013-2016)

Treatments	Damage percentage (%)			
	2013	2014	2015	2016
T1: 1kg soybean seeds (control without rice husk ash)	100	100	100	100
T2: 1kg soybean seeds+ 100g rice husk ash	80	73	75	77
T3: 1kg soybean seeds+ 150g rice husk ash	60	51	55	59
T4: 1kg soybean seeds+ 200g rice husk ash	30	37	27	17
T5: 1kg soybean seeds+ 250g rice husk ash	0	0	0	0
T6: 1kg soybean seeds+ 300g rice husk ash	0	0	0	0
T7: 1kg soybean seeds + 350 g rice husk ash	0	0	0	0
T8: 1kg soybean seeds+ 400g rice husk ash	0	0	0	0
T9: 1kg soybean seeds+ 450g rice husk ash	0	0	0	0
T10: 1kg soybean seeds+ 500g rice husk ash	0	0	0	0

It may be due to the fact that rice husk ash which contains Iron oxide (Fe2O3 = 0.05%), Silicon Dioxide (SiO2= 96.7%), Aluminium Oxide (Al2O3= 1.01%), Calcium Oxide (CaO= 0.49%), Potassium Oxide (K2O= 0.91%) (Kartinic, 2011) [2]. Dessication or application of rice husk ash might have filled up the inter-granular spaces and effectively disrupted the reproductive behavior of the insect pests, thereby, preventing further infestation on the stored grains. Similar result was also obtained by Rajasri and Kavitha (2015) [4] that dust, such as silica gel or diatomaceous earth, can be combined with certain stored grains to provide protection against insect damage. These dusts killed target insects by dessication. In the similar way, Reddy (2005) [5] reported that traditional practice of protecting the pulse grains from the storage pests and insects, any one of wood ash or cow dung ash were mixed and kept stored in bins or bags. The farmers believed that these substances act as insect repellents. This practice protected the grains upto a few months from pests and insects. The soybean seeds that were stored devoid of any rice husk ash showed a 100% damage after a year of storage. But in treatments T2 to T4 i.e., 1: 0.10, 1: 0.15, 1: 0.20, comparatively less damage was found than the T1 i.e., control. It might be due to sparse coverage by the rice husk ash which led the insect pests to develop in the possible space.

Conclusion

Soybean seeds could be stored in rice husk ash at the ratio 1: 0.25 and above to protect from the damage of insect pests for one year in Manipur condition, serving as a convenient organic method of storage. Rice is the staple food of Manipur hence, it becomes all the more convenient to procure rice husk for the purpose. It would be environmental friendly solution and could be promoted as one of the effective and useful agro- waste management practices.

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