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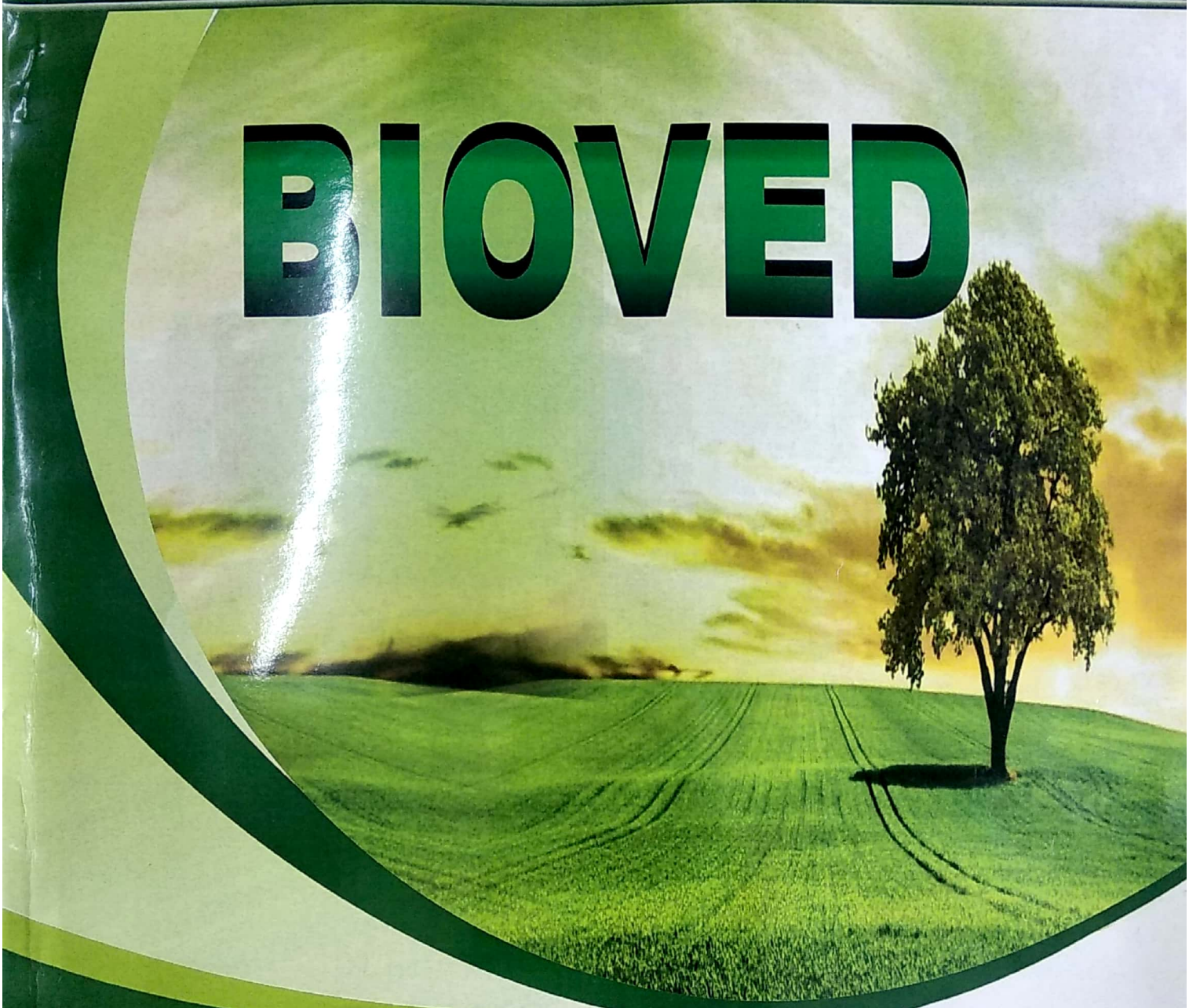

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Optimization of traditional pre-milling treatment for pigeon pea dehulling

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ABSTRACT : Pigeon pea (*Cajanas cajan*) is one of the important pulse crops of India, contributing about 20% to the total production of all pulses. It accounts for 90% of the total world production of pigeon pea. Cleaned and graded lots of pigeon pea *cv.* P-992 were selected for the study. Two pre-milling methods were undertaken for the study namely; hydrothermal and heat treatment. Steam pressure and residence time for the hydrothermal treatment were taken as independent variables. Three levels of each, steam pressure (0.5, 1, 1.5 kg/cm^2) and residence time (5, 10, 15 min) were taken for hydrothermal treatment method. Under heat treatment, temperature and treatment duration, each of four levels was taken as independent variables. Heat treatment was conducted for temperature: 65, 85, 105, 125°C and duration: 2,4,6,8 min. Both the treatments had shown significant effect on milling performance. Under hydrothermal treatment, steam pressure 0.5 kg/cm^2 for 10min yielded maximum hulling efficiency; 84.527% and finished product recovery; 52.07%. However, among all the heat treatment under the study, temperature 85±5°C for 4min resulted to the maximum hulling efficiency 84.28% and finished product recovery; 53.53%. On the basis of the above observations, hydrothermal treatment at 0.5 kg/cm^2 for 10 minute is recommended for resource full farmers and for resource poor farmer's heat treatment at 85±5°C for 4 min. Optimized treatments trials on IARI Mini Dal mill successfully yielded finished product recovery of 72.83% and hulling efficiency: 90.47% with pre-milling heat treatment at 85°C for 4 min. The hydrothermal treated lot resulted finished product recovery: 74.96% and milling efficiency: 90.77%. Further increase of product recovery and dehulling efficiency was observed with scouring the kernel before treatment. Cost of processing was found to be 1.25 Rs/kg and 1.60 Rs/kg for heat and hydrothermal pre-milling treatment and milling by IARI Mini Dal Mill, respectively.

Key Words: Optimization, pre-milling method, dehulling efficiency, product recovery.

Pigeon pea (*Cajanus cajan*) is one of the most important pulse crops of India, contributing about 20% to the total production of all pulses and accounts for 90% of the total world production of pigeon pea. It is consumed as dehusked splits commonly, known as *dal*. Pigeon pea *dal* is an important dietary constituent, especially for the vegetarian population of India, as a source of protein. Before cooking or other processing operations, it is necessary to remove the fibrous seed coat (hull) of pigeon pea to improve its palatability. The hull of pigeon pea adheres tightly to the cotyledons through a gummy layer that hinders separation of hull during milling. This makes it a problematic pulse regarding milling. In general, there are two approaches to remove hull of pulses are common, namely; wet and dry milling. The dry method of milling is used throughout the Indian subcontinent (Kurien and Parpia, 1968). However, commercially both dry and wet methods are used for dehulling of pigeon pea (Phirke and Bhole, 1999). Pre-treatment using oil involves using a large quantity of edible oil, nearly 50–100 g/kg of pigeon pea. Goyal *et al.* (2008) reported that 0.3% mustard oil pre-milling treatment process could enhance dehulling efficiency to 83.2% with. The maximum theoretical recovery from dehulling is around 87–89%, whereas traditional method dehulling recovery reported is only about 65–75%. Dehulling, often leads to losses in form of powder and broken seed. Powder and broken seed losses had been found to be as high as 12.8% and 4.4%, respectively.

In recent years, several advances have been made in optimizing the pre-milling treatment for pigeon pea milling, but in rural India farmers following same traditional methods of milling due to lack of knowledge, available resources and finance. However, there are some good traditional pretreatments are available that famous in the name of dry milling and wet milling for milling of pigeon pea in some part of country (Singh and Sahay, 1994). In that heat treatment to pigeon pea by using sand as a medium is common practice in some parts of northern India at rural level but it's not up to the mark in getting good product recovery and hulling efficiency. This may be due to unexplored critical parameters of the process. So considering above points, the present study was undertaken to standardize heat treatment for resource poor farmer with locally available resources. (Kurien and Parpia, 1968) reported that seed coat could be loosened and brittle by an incipient roasting at 70-90°C followed by tempering. At commercial level there