Combination of raw materials	Approximate cost Rs.
Saw dust 40% + Groundnut shell 60%	86(
Coffe husk 20% + Groundnut shell 30% + Saw dust 50%	85(
Saw dust 80% + marigold 20%	76(
Groundnut shell 40% + turmeric dust 10% + coffee husk 30% + marigold 10% + cotton dust 10%	78(

fuels like coal and also wood. Continuity in supply and confidence in the produce are the two major considerations for marketing briquettes in India.

Small-scale industries are the major marketing base for biomass briquettes. Rubber industries, textile dyeing units, leather processing units, small boiler units, tobacco processing units, brick kilns and the domestic sector which use huge amount of wood and loose biomass have to switch over to briquettes.

Traders who were already engaged in supplying coal/charcoal/wood possessing godown facilities and familar with market base have established some units of their own.

In this context more than 16 firms are reported to be in business in Tamil Nadu and the survey was conducted with them to collect details.

The combination of raw materials used and the approximate cost is furnished in the table.

Conclusions

With the environmental impacts of fossil fuel use emerging as major threat to the socity, renewable energy in general and biomass energy in particular, are expected to assume increasing importance in the future. The study shows that briquetting is a promising enterprise provided that appropriate decision is taken on selection of raw material depending on seasonal availability. There is great scope for briquettes and can compete well with wood in specific applications.

(Received: May 2002; Revised: April 2003)

Madras Agric. J. 90 (7-9) : 550-553 July-September 2003

Research Notes

Effect of storage containers and seed treatments on seed viability and vigour of greengram (*Vigna radiata* (L.) Wilczek) cv. CO 6

K. RAJA, A. BHARATHI AND T.V. KARIVARADARAAJU
Dept. of Seed Science and Tech., Tamil Nadu Agricultural University, Coimbatore - 641 003, Tamil Nadu

One of the most important basic needs for higher agricultural production is quality seed, characterized by high viability and vigour. Maintenance of seed viability and vigour from harvest till the next growing season is of the utmost importance in a seed production programme. Pulses are being cultivated in an area about 226 lakh hectares in India, with the production of 121 lakh M.T. (Karivaradaraaju, 2000). During seed storage, qualitative and quantitative losses upto 8.5% have been reported in India (Anon, 1978). The poor seed quality may also be due to the poor storability which is very often being decided by the internal and external factors. In pulses, the major cause for seed deterioration during storage is bruchid damage. Among different species of bruchids, *Callosobruchus maculatus* (L.) is considered to be the most destructive in India and causing severe damage to the storage seed to the extend of 93.33% in different pulse crop (Parsai *et al.* 1989). The seed deterioration is also hastened by adverse storage

Table 1. Effect of containers and seed treatments on germination and vigour index of greengram cv. CO 6

Period of storage	Cloth bag								Polythene bag (700 gauge)							
	Control		Thiram		Neem oil		Malathion dust		Control		Thiram		Neem oil		Malathion oil	
	G (%)	VI	G (%)	VI	G (%)	VI	G (%)	VI	G (%)	VI	G (%)	VI	G (%)	VI	G (%)	VI
P_0	87 (68.88)	7480	87 (68.88)	7395	89 (70.65)	4565	92 (73.57)	7820	88 (69.73)	7430	96 (78.46)	8160	94 (76.02)	7990	88 (69.73)	7480
P_1	84 (66.42)	5670	92 (73.57)	6900	92 (73.57)	7176	88 (69.73)	6512	86 (68.08)	6786	93 (74.70)	7063	97 (80.14)	7663	92 (73.57)	6900
P_2	80 (63.43)	5680	88 (69.73)	6468	90 (71.65)	6976	86 (68.08)	6234	84 (66.42)	6174	88 (70.00)	6600	92 (74.10)	7176	88 (69.73)	6556
P_3	76 (60.67)	5320	88 (69.73)	6380	88 (69.73)	6512	84 (66.42)	6006	80 (63.43)	5810	92 (73.57)	6854	96 (78.46)	7392	84 (66.42)	6174
P_4	72 (60.67)	4659	84 (69.73)	6006	83 (69.73)	6406	82 (66.42)	5782	72 (63.43)	5004	88 (73.57)	6336	92 (78.46)	6946	86 (66.42)	6236
P_5	66 (54.34)	4620	82 (64.93)	5700	84 (66.42)	6216	78 (62.05)	5462	64 (53.16)	4320	86 (68.50)	6066	88 (69.73)	6600	84 (66.58)	5928
P_6	52 (46.15)	3250	80 (63.43)	5400	82 (64.93)	5902	76 (60.69)	5244	56 (48.43)	3612	84 (66.58)	5800	84 (66.42)	6216	80 (63.43)	5560
P_7	50 (45.00)	3048	74 (59.36)	5006	80 (63.54)	5638	74 (57.36)	4846	54 (47.30)	3376	80 (63.43)	5360	82 (64.93)	5944	74 (59.36)	4846

	Vigour index							Germination						
	P	C	T	PxC	TxC	TxP	PxCxT	P	C	T	PxC	TxC	TxP	PxCxT
CD (P=0.05)	81.041	49.628	81.041	140.368	140.363	229.33	397.021	0.7133	0.4368	0.7133	1.2355	1.2355	2.0176	3.4946

(Figures in parentheses are arc sign value)

environment, seed moisture content and the containers used for seed storage besides its susceptibility to insect infestation. In this context, evolving an improved storage strategy to prolong the self life of seeds under ambient storage conditions with easily available cost effective resources was carried out.

The experiment was conducted at the Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore during 1999-2000. Freshly harvested seeds of greengram cv.CO 6 were cleaned and graded using BSS, 8x8 wire mesh sieve. Then seeds were dried under sunlight to bring the moisture content to required level (8.5%). The seeds were treated with Thiram @ 2g kg^{-1}, Neem oil @ 10ml kg^{-1} and Malathion dust @ 200 mg kg^{-1}. Two hundred and fifty gram of seeds from all treatments along with control were packed in two containers *viz.* cloth bag and polythene bag (700 gauge) with three replication and stored in at ambient temperature (30°C - 35°C) and relative humidity (52-80%). Seed samples were drawn from each

Table 2. Effect of containers and seed treatments on bruchid damage (%) in greengram cv. CO 6

Period of storage	Cloth bag				Polythene bag (700 gauge)			
	Control	Thiram	Neem oil	Malathion	Control	Thiram	Neem oil	Malathion
P0	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
P_1	2.00 (1.42)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.00 (1.22)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
P_2	1.00 (3.39)	0.00 (0.73)	0.00 (0.71)	0.00 (0.71)	6.00 (2.82)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
P_3	19.00 (4.41)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	14.00 (3.80)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
P_4	29.00 (5.43)	0.00 (0.71)	0.00 (0.71)	2.00 (1.410	22.00 (4.74)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
P_5	31.00 (5.61)	0.00 (0.71)	0.00 (0.71)	3.00 (1.85)	23.00 (4.85)	0.00 (0.71)	0.00 (0.71)	2.00 (1.41)
P_6	37.00 (6.12)	0.00 (0.71)	0.00 (0.71)	5.00 (2.34)	29.00 (5.43)	0.00 (0.71)	0.00 (0.71)	3.00 (1.85)
P_7	41.00 (6.44)	0.00 (0.71)	0.00 (0.71)	7.00 (2.73)	35.00 (5.96)	0.00 (0.71)	0.00 (0.71)	3.00 (1.85)
		P	C	T	P x C	T x C	T x P	P x C x T
CD (P=0.05)	0.1078	0.0660	0.1078	0.1867	0.1867	0.3049	0.5282	

(Figures in parentheses are arc sign value)

replication at monthly interval for assessing the viability and vigour. Germination test was conducted in between paper method and seedlings were evaluated on seventh day (ISTA, 1999) for Vigour index (Abdul-Baki and Anderson, 1973) bruchid infestation (Mohan, 1993). The results were statistically analysed as per Panse and Sukhatme (1978).

The effect of different containers, seed treatments and period of storage on viability of greengram seeds were shown in Table 1. The containers have considerable effect on germination and vigour index of seeds. The reduction in germination and vigour index was higher for seeds stored in clothbags as compared to polythene bag (700 gauge). Seeds treated with neem oil @ 10ml kg^{-1} performed better as compared to other treatments *viz.* thiram and malathion. But the untreated seeds recorded lower germination per cent and vigour index after seven months of storage. Neem oil/neem product has an antioxidant property like acetyl salicylic acid in reducing the lipid peroxidation, protein degradation and chromosomal aberrations and simultaneously controlling the deterioration process (Umarani and Vanangamudi, 1999). There was no bruchid damage on seeds treated wi neem oil @ 10ml kg^{-1} and thiram @ 2g k of seeds after 7 months of storage in clothb than the seeds treated with malathion @ 2(mg kg^{-1} (Table 2). Untreated seeds record higher bruchid damage. The bruchid dama increased with increase in storage period. T bitter compound azadirachtin present in nee seeds showed insecticidal property against variety of storage and field crop pests. Crush neem seed at one or two per cent protect the pulse seeds from *Callosobruchus maculat* (Jotwani and Sircar, 1967). Seeds treated wi neem seed powder reduced oviposition, e hatching and adult emergence (Makanjuola, 198 Though thiram is a fungicide it effective controlled the bruchid infestation. Thiram metabolized to the isothiocyanate radical whi inactivates the sulfhydral groups (-SH) of ami acids and enzymes within the insect cells a thereby inhibits the production and functi of these compound in the insect cells. It w concluded that the self life of greengram see could be increased by treating the seeds wi neem oil and stored either by polythene b (700 gauge) or clothbag.

eferences

bdul-Baki, A.A. and Anderson, J.D. (1973). Vigour determination in soybean seed by multiple criteria. *Crop Sci.* **13**: 630-633.

non. (1978). Post harvest food losses in developing countries. Nation. Acad. Sci., Washington, D.C. p.220.

TA. (1999). International rules for seed testing. *Seed Sci. and Technol., Supplement Rules,* **27**: 25-30.

twani, M.G. and Sircar, P. (1967). Neem seed as a protestants against bruchid *Callosobruchus maculatus* (F.) infesting some leguminous seeds. *Ind. J. Ent.* **29**: 21-24.

arivaradaraaju, T.V. (2000). Paper on increasing the productivity of rice-fallow pulses. Tamil Nadu Agricultural University, Coimbatore - 641 003.

akanjuola, W.A. (1989). Evaluation of extracts of neem (*Azadirachta indica* A. Juss) for the control of some stored product pests. *J. Stored Product Res.* **25**: 231-237.

Mohan, S. (1993). A new device to trap pulse beetle. *TNAU Newsletter,* **23**: 1.

Panse, V.G. and Sukhatme, P.V. (1978). Statistical methods for agricultural workers. ICAR, Pub., New Delhi.

Parsai, S.K., Rawat, R.R. and Choudhary, P.K. (1989). Ovipositional behaviour and preference of the bean beetle, Callosobruchus phaseoli, its extent of damage in stored seeds of different varieties of field bean. *Bull. Grain Technol.* **27**: 103-106.

Umarani, R. and Vanangamudi, K. (1999). Improvement in storability of *Casuarina equisetifolia* seeds through pre-storage treatments by triggering their physiological and biochemical properties. National symposium on forestry towards 21st Century, Sep.27-28, Tamil Nadu Agricultural University, Coimbatore - 641 003.

(Received: August 2002; Revised: April 2003)

---

adras Agric. J. 90 (7-9) : 553-557 July-September 2003

esearch Notes

Management of seed borne grain mould disease of sorghum with botanicals

C. MENAKA, K. VANANGAMUDI, K. PRABAKAR, A. BHARATHI AND P. NATESAN
Dept. of Seed Science and Tech., Tamil Nadu Agricultural University, Coimbatore - 641 003, Tamil Nadu

In semitropical areas like Africa and Asia, he poor man's crop *viz.* sorghum (*Sorghum icolor* (L.) Moench) has been grown for grain s well as for forage. India has the largest hare in (32.3%) world area in sorghum and anked second in production after USA. An utstanding characteristics of sorghum is its bility to produce grain under conditions too evere particularly in dry conditions. Good seeds re a symbol and a foundation of good agriculture.

Grain mould is one of the most widespread nd devastating diseases of sorghum and ranks umber one, primarily because, it concerned vith the quality of seed/grain (Frederiksen, 1982). The more pathogenic field fungi that seriously damage seed/grain in sorghum are primarily *Fusarium monilifome* and *Curvularia lunata* (Castor and Frederiksen, 1982).

The physical, physiological and biochemical changes that occur in seed due to grain mould infection are discolouration of earhead and individual grains, viability of seeds was reduced (Narasimhan and Rangaswamy, 1969), vigour of seedlings was reduced, reduction in the content of total sugars, reducing sugars and non reducing sugars (Williams and McDonald, 1983), rapid decrease of starch, the increase in phenolics due to infection (Farkas and Kiraly, 1962) and changes in protein content of seeds.