phenomenal yield increase of 59.1 per cent over the local with a mean yield of 1356 kg/ha. KS 6312 is a short duration variety coming to harvest in 95 days. It is a tan plant type, remaining green even at maturity. It is non-lodging and tolerant to terminal drought. Grains are pearly white, rich in protein and amenable for preparation of food products like pakoda, porridge and hence, it is highly acceptable in market with a high consumer preference. It is moderately resistant to stem borer and shoot-fly besides being tolerant to leaf spot diseases. (Table 2 & 3).

KS 6312 is very much suitable to be grown as a rainfed crop in rabi season in southern districts of Tamil Nadu. The yield potential for grain and straw is 4800 kg/ha and 15.5 t/ha respectively. In view of the superior performance of KS 6312 in respect of grain and straw production combined with good nutritional and cooking quality, this has been released as K 8, suitable for the southern districts of Tamil Nadu.

Madras Agric. J. 80 (12) : 680 - 684 December 1993 https://doi.org/10.29321/MAJ.10.A01720

EFFECT OF CABBAGE SEED TREATMENT ON SEED VIABILITY, SEEDLING VIGOUR AND CONTROL OF BLACK ROT

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ABSTRACT

Seeds treated with streptocycline at 100 ppm + captan at 2 g per kg resulted in higher germination and increased seedling vigour besides maximum elimination of seedlings infection of black rot. The growth of *Xanthomonas campestries* pv. *campestries* in seeds was more inhibited when treated with streptocycline at 100 ppm + captan at 2 g per kg.

The black rot of cabbage caused by *Xanthomonas campestris* pv *campestries* is one of the widespread diseases of cabbage in many parts of the world. The seed borne pathogen was well established (Harding, 1904). Seed treatment with 0.1 per cent mercuiric chloride for half an hour was effective in eradicating seed borne infection. Effectiveness of antibiotics in combination with fungicides was reported in many bacterial diseases (Nayak et al., 1976). The present study reports the influence of seed treatment with chemicals, hot water and antagonists on seed viability, seedling vigour and control of seedling infection.

MATERIALS AND METHODS

The Xanthomonas campestries pv. campestries isolated from infected cabbage leaves collected from Ooty and maintained on yeast extract, glucose chalk agar was used for inoculation of cabbage seeds, by soaking them for 6h in bacterial suspension (c.l x 10^7 cells/ml) prepared from 24 to 48h cultures and dried under shade for 24h. The inoculated seeds were then divided into different lots and treated with fungicides, bactericides, hot water and antagonists.

1. Seed treatment

The seeds were treated with fungicides at 2g per kg by dry seed dressing. The seeds were shaken with the fungicides in a

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Table 1. Effect of seed treatment with chemicals, hot water and antagonists on seed viability and seedling vigour

Treatment	Germination percentage	Root length (cm)	Shoot length (cm)	Dry matter production (mg)	Vigour index based on		
					Germination and root length	Germination and seedling length	Germination and dry matter
Hot water	90.00^{bc}	9.53^{a}	8.14^{a}	8.07^{bcd}	858.27^{ab}	1589.87^{abc}	699.47^{bcde}
Agrimycin-100 + captan	90.34^{bc}	10.00^{a}	8.04^{a}	8.20^{bc}	903.17^{ab}	1628.67^{abc}	740.70^{abc}
Streptocycline + Captan	93.34^{a}	10.20^{a}	8.77^{a}	8.74^{a}	952.60^{a}	1770.54^{a}	799.54^{a}
Streptomycin sulphate + Captan	90.00^{bc}	9.47^{a}	8.14^{a}	8.14^{bc}	852.60^{ab}	1585.14^{abc}	732.00^{abc}
Bactrinol - 100 + Captan	92.67^{ab}	10.34^{a}	8.06^{a}	8.44^{ab}	957.74^{a}	1705.20^{ab}	781.60^{ab}
Agrimycin - 100	86.67^{cd}	9.57^{a}	7.50^{bc}	8.00^{cd}	828.60^{abc}	1478.60^{cd}	683.07^{def}
Streptocycline	89.66^{d}	9.24^{a}	7.54^{c}	8.04b^{cd}	792.17b^{cd}	1442.77^{cd}	693.44^{cdef}
Streptomycin sulphate	89.00^{cd}	9.00^{ab}	8.00^{a}	7.94^{cd}	801.20^{bc}	1513.14^{bc}	706.14^{bcde}
Bactrinol - 100	89.67^{cd}	8.90^{ab}	7.97^{ab}	8.44^{ab}	798.77^{bc}	1513.03^{bc}	747.34^{abc}
Captan	79.34^{e}	8.80^{b}	7.20^{bc}	8.44^{ab}	698.27^{cde}	1322.80^{de}	660.93^{def}
Trichoderma viride	76.67^{e}	8.34^{b}	7.27^{bc}	8.37^{ab}	638.14^{ef}	1195.60^{ef}	642.00^{ef}
Trichoderma harzianum	75.34^{e}	8.07^{b}	7.40^{bc}	8.24^{bc}	641.00^{def}	1200.27^{de}	622.84^{f}
Inoculated control	67.67^{f}	8.03^{b}	7.07^{c}	7.80^{d}	544.00^{f}	1021.80^{f}	527.80^{g}
Uninoculated control	91.67^{abc}	10.07^{a}	8.27^{a}	8.10^{bcd}	923.27^{ab},	1680.80^{ab}	745.54abc

In a column, the means followed by similar letters are not different statistically (P=0.05) by DMRT

plastic container for 15 min. In case of bactericides, the seeds were soaked in bactericide solution (100 ppm) for 2h and shade dried. In case of combination of seed treatment with fungicides and bactericides, the seeds were treated first with bactericides and 24h later with fungicides. Hot water treatment was given by dipping the seeds in water bath at 50°C for 30 min.

Trichoderma viride and *I.harzianum* grown on PDA medium for 14 days were suspended in sterile distilled water, blended and filtered through a muslin cloth. The filtrate containing conidia was centrifuged at 3000g for 10 min. The supernatant was discarded and the conidial pellet was resuspended in sterile distilled water. The process was repeated again and finally the conidia were suspended in 10ml of 0.1 per cent carboxy methy cellulose solution. The concentration was adjusted to 4.8 to 5.2 x 10^9 conidia per ml using a haemocytometer. Three ml of this suspension was used to coat 10g of cabbage seeds following the methods of Sivan *et al.* (1984).

1.1 Viability and Seedling Vigour

i) Germination Test by Roll Towel Method

The test was conducted by following the procedure proposed by International Seed Testing Association (1985). The seeds were allowed to germinate at 25±5°C temperature and 90±3 per cent relative humidity in the germination room.

ii) Root Length

Ten normal seedlings were selected from the roll towel and the root length was measured in cm from collar region to the tip of the root and recorded.

Table 2. Effect of seed treatment with chemicals, hot water and antagonists on the inhibition of X.campestris in mm

Treatment	Mean inhibition zone after 24th (diameter in mm)
Hot water	0.0/not analysed
Agrimycin-100 + Captan	3.64^{cd}
Streptocycline + Captan	3.64^{a}
Streptomycin Sulphate + Captan	4.04^{c}
Bactrinol - 100 + Captan	4.44^{ab}
Agrimycin - 100	3.40^{g}
Streptocyclin	4.34^{ab}
Streptomycin sulphate	3.97^{cd}
Bactrinol - 100	4.24^{bc}
Captan	1.16^{e}
Trichoderma viride	0.00 not analysed
Trichoderma harzianum	0.00 not analysed
Inoculated control	0.00 not analysed
Control	0.00 not analysed

In a column, the means followed by similar letters are not different statistically (P=0.05) by DMRT

iii) Shoot Length

The same 10 normal seedlings were used for measuring the shoot length from collar region to the tip of the shoot and recorded in cm.

iv) Dry Matter Production

After measuring root length and shoot length, 10 normal seedlings taken from each treatment were dried in hot air oven maintained at 85°C for 24 hours and cooled in a desiccator. then the weight of the dried seedlings was recorded in mg.

v) Vigour Index

The Vigour index was calculated using the following formula and expressed as whole numbers by following the procedure suggested by Abdul Baki and Anderson (1973).

a) Vigour index = (Germination percentage) x (Root length) [Mean of ten normal seedlings in cm]

b) Vigour index = (Germination percentage) x (Total seedling length) [Mean of ten normal seedlings in cm]

c) Vigour index = (Germination percentage) x (Dry weight) [Mean of ten normal seedlings in mg]

1.2 Inhibition Zone Assay

Five seeds were plated on nutrient agar medium (seeded with X. *campestres* pv. *campestres*) and incubated at 25±1°C. Observations were taken after 24h of incubation. Three replications were maintained. The diameter of the inhibition zone that developed around the seed was measured in mm.

1.3 Pot Culture Experiment

In this experiment, treated seeds were sown at 10 per pot, replicated four times and arranged randomly. On the 10th day, the germination percentage was recorded. Three weeks after germination the seedling infection was recorded.

RESULTS AND DISCUSSION

i) Seed Viability and seedling vigour

The seeds inoculated with bacterial pathogen followed by chemical treatments were tested for the germination percentage, root length, shoot length, dry matter production and vigour index. The observations were recorded for all treatments and the

Table 3. Effect of seed treatment with chemicals, hot water and antagonists on the control of black rot under pot culture condition

Treatment	Germination (%)	Per cent increase over control	Seedling infection (%)	Per cent reduction Over control
Hot water	80.00	45.25	3.12	90.19
Agrimycin 100 + Captan	77.50	40.90	6.45	79.72
Streptocycline + Captan	82.50	50.00	3.03	90.48
Streptomycin sulphate + Captan	80.00	45.45	6.25	80.36
Bactrinol 100 + Captan	80.00	45.45	3.12	90.19
Agrimycin 100	60.00	9.09	12.50	60.72
Streptocycline	72.50	31.82	14.28	55.12
Streptomycin sulphate	65.00	18.18	11.53	63.76
Bactrionol - 100	67.50	22.73	7.40	76.74
Captan	60.00	9.09	29.17	8.33
Trichoderma viride	62.50	13.64	32.00	-
Trichoderma harzianum	60.00	9.09	29.17	8.33
Control - 1 (Inoculated seeds)	55.00	-	31.82	-
Control - 2 (Uninoculated seeds)	80.00	45.45	0.00	-
CD=	8.64		14.02	

data are presented in Table 1. The results clearly showed that the seeds treated with streptocycline + captan recorded higher germination percentage, longer roots and shoots, more dry matter and higher vigour index, followed by bacterinol 100 + captan, agrimycin 100 + captan and streptomycin sulphate + captan while inoculated control recorded lowest values for all the parameters.

This is in confirmity with those reported by Rangarajan and Chakravarti (1970) in case of maize seeds inoculated with seven isolates of bacterial stalk rot pathogens. However, the present study revealed that the bacteria inoculated seeds treated with bactericide, fungicide,hot water and bactericide in combination with captan improved seed germination.

ii) Inhibition zone assay

The results showed that the growth of X. *campestris* was inhibited more in streptocycline + captan treated seeds (4.64 mm), followed by bacterinol 100+captan (4.44mm) and streptocycline (4.34mm). Hot water, *Trichoderma Viride* and *T.harzianum* did not inhibit the growth of *X.campestris* pv. *campestris* (Table 2) Shah *et al.* (1985) reported that streptocycline alone and also in combination with captan were found to be effective in inhibition of *X. campestris* pv. *campestris*.

iii) Seed gemination and seedling infection

Among the different chemicals tested, the seeds treated with streptocycline + captan recorded highest germination percentage of 82.50 as against 55 in the inoculated control. Seeds treated with streptocycline + captan also recorded highest per cent elimination of seedling infection with 90.48 followed by hot water and bacterinol 100 + captan which recorded 90.19 and 90.19 respectively (Table 3). In the present study, the seeds inoculated with bacteria without chemical treatment recorded poor germination which is conformity with the findings of Rangarajan and Chakravarti (1970) who have reported that seeds inoculated with bacteria are known to reduce the germination. Effectiveness of bactericides in combination with fungicides has been reported in controlling many bacterial diseases (Nayak *et al.*, 1976). The effectiveness of hot water treatment was also reported in controlling black rot of cabbage (Shah *et al.*, 1985).

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Madras Agric. J. 80 (12) : 684 - 688 December 1993

DETERMINING OPTIMUM SEASON FOR THE PRODUCTION OF QUALITY SEEDS IN MUNGBEAN

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ABSTRACT

The monthly sowing studies carried out with mungbean cultivar CO 3 for one year (January to December) under coimbatore conditions had brought out the need for sowing the seed crops during the summer months namely, from February to April for getting higher seed yield associated with larger recovery of quality seeds. The hard seed percentage however was more in the produce of the resulting crop. On the other hand, seed crops raised during May to December resulted in low seed yield combined with larger percentage of off-colour seeds which on the seed quality point of view needs to be eliminated.

Basically, seed production technology differs from that of grain production in several respects. The factors affecting seed quality, weather, environmental, biotic, physical or phsiological, need to be considered duly in any seed production venture, one such example will be the occurrence of large percentage of hard seeds or off-colour seeds in seed lots of black gram (Dharmalingam and Ramakrishnan, 1978) and mungbeen raised during certain seasonal conditions. The use of hard seeds for immediate planting (Dharmalingam *et al.*, 1976) and of discoloured and carry over seeds would adversely affect the field stand and growth of the subsequent crop. In order to enquire into certain of the causes that would influence the quality of seeds during production, an attempt has been made in the present study with the mungbean seeds of the cultivar Co 3.

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