Table 7. Effect of bitter gourd mosaic virus infection on fruit characters

Variety	Mean number of fruits		Mean	Mean length of fruit (cm)		Mean	Mean girth of fruit (cm)		Mean	Mean weight of fruit (kg)		Mean	Total yield of fruit (kg)		Mean
	I_0 (Control)	I_1 (Inoculated)		I_0 (Control)	I_1 (Inoculated)		I_0 (Control)	I_1 (Inoculated)		I_0 (Control)	I_1 (Inoculated)		I_0 (Control)	I_1 (Inoculated)	
V_1	14.00	10.50	12.25	17.50	13.90	15.70	17.52	12.20	14.86	0.26	0.14	0.20	3.57	1.32	2.44
V_2	12.50	9.00	12.50	13.45	12.10	12.78	10.58	9.24	9.91	0.18	0.12	0.15	2.25	1.08	1.67
Mean	13.25	9.75		15.48	13.00		14.10	10.72		0.22	0.13		2.91	1.20	
	Cd (V) = 1.94 CD (I) = 1.94 Cd (VxI) = 2.74			CD (V) = 1.05 CD (I) = 1.05 CD (VxI) = 1.49			Cd (V) = 0.72 Cd (I) = 0.72 CD (VxI) = 1.02			Cd (V) = 0.02 CD (I) = 0.02 CD (VxI) = 0.03			CD (V) = 0.14 CD (I) = 0.14 CD (VxI) = 0.19		

140 by 31 per cent. The results of the present study also showed similar trend.

REFERENCES

DUBEY, G.S., NARIANI, T.K. and PRAKASH, N. (1974). Identification of snake gourd mosaic virus. **Indian Phytopath., 27** : 470-474.

JAYASREE, P.K. (1984). **Yellow Vein Mosaic Disease of pumpkin in Kerala.** M.Sc. (Ag.) thesis, Kerala Agricultural University. 74 pp.

KARACHI, Z., COHEN, S., GOVERS, A. and YOSEPH, R. (1978). Response of susceptible and resistant cantaloupes (*Cucumis melo*) to cucumber mosaic virus under field conditions. **Phytoparasitica 6** : 9-13.

KERALA AGRICULTURAL UNIVERSITY (1993). **Practices Recommendations 1993**. Director of Extension, Mannuthy, 680651, Kerala, India, 237 pp.

PILLAI, N.G. (1971). A mosaic disease of snake gourd (*Trichosanthes anguina* L.). **Sci. & Cult., 37** : 46-47.

RAGHUNADHAN, D. (1989). **Transmission, Properties and Host-range of Snake Gourd Mosaic Virus.** M.Sc. (Ag.) thesis, Kerala Agricultural University. 121 PP. (Thesis).

SINGH, S.J. (1986). Assessment of losses caused by a strain of watermelon mosaic virus in pumpkin (*Cucurbita maxima* Duch.). **Indian J.Plant Pathol., 4** : 165-167.

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COIRPITH COMPOST A SUITABLE MEDIUM FOR MASS MULTIPLICATION OF *Glomus Fasciculatum*

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SUMMARY

An experiment was conducted to find out the best substrate for quick VAM fungi inoculum production. Different substrates *viz.*, compost, composted pressmud, composted coirpith, vermiculite, perlite and vermiculite-perlite (1:1) were screened in this study. The result revealed that composted coirpith was found to be superior in terms of infection percentage, extra- matrical hyphae and spore count. The finding indicated that composted coirpith could be employed as a substrate material for VAM fungi inoculum production.

KEY WORDS : VAM inoculum, substrate, inoculum

VAM fungi are difficult to culture on a commercial scale because they are obligate symbionts. They can be grown with host plants in pot cultures by employing various substrates. They have also been grown by using hydroponics, aeroponic culture and root organ culture. The common growth medium is soil and is being replaced by inert substances such as vermiculite, perlite sand or a mixture of these for crude inoculum production. The soil based inocula are potentially the best, since, after 6-12 months highly infective inocula can be produced. But this

Table 1. Effect of *Glomous fasciculatum* inoculum produced from different substrates on the root biomass of maize.

Treatment	Root biomass (g/plant)			
	DAS			Mean
	30	45	60	
Compost	3.20	5.30	6.80	5.10
Composted pressmud	4.62	6.26	7.87	6.25
Composted coirpith	5.57	9.23	9.85	8.21
Vermiculite	0.40	2.89	3.58	2.30
Perlite	1.26	3.14	3.93	2.78
Vermiculite - Perlite (1:1)	2.07	3.93	4.63	3.54
Mean	2.85	5.13	6.11	4.70

DAS - Days after sowing

	SEd	CD
Treatment	0.033	0.066
Stages	0.023	0.046
Treatment x stages	0.057	0.114

inoculum is too heavy for extensive use in agriculture. The use of calcined montmorillonite clay and expanded clay aggregates as a supporting media was established by different firms for mass production of VAM fungi. Various VA-mycorrhizal fungi bound to an inorganic carrier such as expanded clay provided a highly efficient method for inoculating various host plants. According to Sreenivasa and Bagyaraj (1988) perlite-soilrite mix (1:1 by volume) was found to be the best substrate for mass multiplication of *Glomus fasciculatum* on the basis of root colonization, spore production and infective propagules. Singh *et al.*, (1991) reported that mass inoculum of *Glomus aggregatum*, *G. fasciculatum*, *G. mosseae* and *Gigaspora margarita* are being prepared at BAIF, Pune by using soilrite and perlite as growth medium. Use of vermiculite as a substrate for soil for mass production of VAM fungi was developed at TNAU, Coimbatore which recorded 90 per cent of colonization in maize roots on 45th day after sowing. (Santhanakrishnan, 1990). The present investigation was carried out to find a cheap substrate for quick production of VAM fungal inoculum.

Table 2. Effect of *Glomous fasciculatum* inoculum produced from different substrates on the dry weight of maize.

Treatment	Biomass (g/plant)			
	DAS			Mean
	30	45	60	
Compost	7.05	8.28	9.10	8.14
Composted pressmud	7.80	7.70	9.87	9.12
Composted coirpith	9.87	10.82	11.77	10.82
Vermiculite	0.72	4.32	4.87	3.30
Perlite	0.79	4.42	5.48	3.56
Vermiculite - Perlite (1:1)	1.92	4.90	6.85	4.56
Mean	4.69	7.07	7.99	6.58

DAS - Days after sowing

	SEd	CD
Treatment	0.06	0.12
Stages	0.04	0.08
Treatment x stages	0.10	0.20

Table 3. Effect of different substrates on the number of spores of *Glomus fasciculatum*

Treatment	Spore count (100 ml^{-1} substrate)			
	DAS			Mean
	30	45	60	
Compost	56	70	106	77
Composted pressmud	66	78	121	88
Composted coirpith	74	84	135	97
Vermiculite	42	53	91	62
Perlite	46	57	95	66
Vermiculite - Perlite (1:1)	54	63	113	76
Mean	56	56	56	67

DAS - Days after sowing

	SEd	CD
Treatment	0.86	1.71
Stages	0.61	1.21
Treatment x stages	1.50	3.00

MATERIALS AND METHODS

Six different substrate materials were used in this experiment *viz.*, compost, composted pressmud, composted coirpith, vermiculite, perlite and vermiculite and perlite (1:1) mixture. The substrate materials were steamed by autoclaving for

Table 4. Effect of different substrates on the per cent root colonization of *Glomous fasciculatum* in maize.

Treatment	Per cent root colonization			
	DAS			Mean
	30	45	60	
Compost	39	44	55	46
Composted pressmud	44	48	71	54
Composted coirpith	47	50	74	57
Vermiculite	27	31	40	32
Perlite	28	32	42	34
Vermiculite - Perlite (1:1)	36	41	52	43
Mean	36	41	55	44

DAS - Days after sowing

	SEd	CD
Treatment	0.44	0.87
Stages	0.31	0.62
Treatment x stages	0.76	1.51

Table 5. Effect of different substrates on extramatrical hyphal weight of *Glomous fasciculatum*

Treatment	Extra matrical hyphal weight* (mg/cm of infected root)			
	DAS			Mean
	30	45	60	
Compost	2.02	2.20	2.75	2.32
Composted pressmud	2.95	3.35	3.80	3.37
Composted coirpith	3.93	4.25	4.75	4.31
Vermiculite	1.98	2.10	2.30	2.13
Perlite	2.03	2.13	2.32	2.15
Vermiculite - Perlite (1:1)	2.20	2.53	2.75	2.50
Mean	2.52	2.76	3.11	2.80

DAS - Days after sowing

* Mean value of four replications

1 h and were mixed with red sandy loam in the ratio of (20:1 v/v). About 10 g of VA-mycorrhizal bulk inoculum consisting of soil with spores and vegetative mycelium was mixed with 5 kg substrate and packed in polyethylene bags. Maize seeds were surface sterilized in 0.1 per cent mercuric chloride and sown 3 cm below the substrate surface and three plants were maintained in each polyethylene bag. Four replications were maintained and the plants were watered regularly. Plant samples were collected periodically at 30, 45 and 60 days after sowing. Shoot length, root length, root biomass and plant dry weight were recorded. The VA mycorrhizal spore count in the substrate material was determined by wet sieving and decanting technique (Gerdemann and Nicolson, 1963) and the percentage mycorrhizal colonization by staining roots with tryphan blue (Phillips and Hayman, 1970). The dry weight of extramatrical hyphae was estimated using maize as the test plant (Porter, 1979). Total uptake of phosphorus by plant was estimated by the vanadomolybdate phosphoric yellow colour method.

Table 6. Effect of different substrates on infective propagules of *Glomous fasciculatum*inoculum

Treatments	Number of infective Propagules g^{-1} inoculum (MPN technique x 10^7)
Compost	3.50
Composted pressmud	4.30
Composted coirpith	5.40
Vermiculite	0.52
Perlite	0.59
Vermiculite - Perlite (1:1)	1.50

RESULTS AND DISCUSSION

Maize plants raised in composted coirpith recorded significant increase in shoot length, root length, root biomass (Table 1), total biomass (Table 2), VAM spore load (Table 3) VA-mycorrhizal colonization (Table 4), extramatrical hyphae (Table 5) and number of infective propagules (Table 6) than other substrates tested in this study. Equal proportion of vermiculite and perlite was found to be superior than vermiculite alone or perlite alone. Maize plants inoculated with *G. fasciculatum* exhibited significant increase in phosphorus content in composted pressmud when compared with other substrate materials at all stages of sampling. Among the different substrates employed, perlite had the smallest amount of nitrogen, phosphorus, potassium, zinc, copper and manganese and composted pressmud had the highest phosphorus content and micronutrients (Table 7). Composted coirpith which proved to be the best for mass production of *G. fasciculatum* inoculum also supported plant growth. As composted coirpith is slightly acidic (pH 6.7), other fungi present in the substrate might have enhanced the multiplication of VAM fungi. This is in line with the work of Gopalakrishnan (1980) who observed synergistic interaction between *G.*

Table 7. Characteristics of the different substrates used for the mass production of VA-mycorrhizal fungi.

Substrate	pH	N (%)	P (%)	K (%)	Zn (ppm)	Cu (ppm)	Mn (ppm)
Compost	6.92	1.50	1.10	1.20	ND	ND	ND
Composted pressmud	7.31	1.60	3.50	1.08	141	1120	142
Composted coirpith	6.75	1.06	0.04	1.09	43	160	370
Vermiculite	7.83	0.06	0.02	0.33	26	2	66
Perlite	7.50	0.06	0.003	0.008	1	1	5
Vermiculite-Perlite (1:1)	7.32	0.06	0.01	0.16	15	1.7	43

ND - Not determined

fasciculatus, phosphate solubilizing fungus *Aspergillus niger* and *Penicillium*. Ramaswami and Kothandaraman (1991) reported that application of composted coirpith decreased the soil bulk density and increased the soil moisture and hydraulic conductivity. Furthermore, composted coirpith was low in phosphorus content which may be the reason for the stimulation of infective propagules. An ideal substrate is expected to be low in organic matter and nutrients. Inhibition of VAM by higher concentration of phosphorus, manganese and zinc is well established. Composted coirpith is cheaper and easily available and so it could be used as substrate for VAM inoculum production.

REFERENCES

GERDEMANN, J.W. and NICOLSON, T.H. (1963). Spores of mycorrhizal endogone species extracted from soil by wet sieving and decanting. **Brit. Mycol. Soc., 46:** 234-244.

GOPALAKRISHNAN, N.N. (1980). **Interaction Between VA Mycorrhiza and Phosphate Solubilizing Fungi and Their Effects of Rhizosphere Microflora and Growth of Finger millet** M.Sc.(Agric.) Thesis, University of Agricultural Sciences, Bangalore.

PHILLIPS, J.M. and HAYMAN, D.S. (1970). Improved process for clearing roots and staining parasite and vesicular-arbuscular mycorrhizal fungi for rapid assessment for infection. **Trans. Brit. Mycol. Soc., 55** : 158-166.

PORTER, W.M. (1979). The "Most Probable Number" method for enumerating I infective propagules of vesicular-arbuscular mycorrhizal fungi in soil. **Aust.J.Soil Res., 17:** 515-519.

RAMASWAMI, P.P. and KOTHANDARAMAN, G.V. (1991). Drought management using agro-industrial wastes. **Proc. of seminar on "Utilisation of Coirpith in Agriculture"**. pp. 83-99.

SANTHANAKRISHNAN, P. (1990). New mass production technology inoculum. **TNAU Newsl. 22** : 3-4.

SREENIVASA, M.N. and BAGYARAJ, D.J. (1980). Selection of suitable substrate for mass multiplication of *Glomus fasciculatum*. **Plant Soil 109:** 125-127.

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YIELD OF RICE CULTIVARS UNDER DIFFERENT METHODS OF ESTABLISHMENT AND SCHEDULES OF IRRIGATION

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ABSTRACT

Investigations carried out at the Agricultural Research Station, Aliyarnagar, Tamil Nadu, India during 1993-94 and 1994-95 revealed that irrigation one day after disappearance of ponded water is the optimum irrigation regime for rice. Water requirement of rice varied from 932 mm to 1138 mm based on the irrigation regime and variety. The management practices of maintaining a population of 33 hills m^{-2} adopting equidistant method of planting four seedlings $hill^{-1}$ proved to be feasible and best for yield maximisation under conditions of labour shortage. Varieties CO 45 and ADT 38 performed better than IR 20 with regard to grain yield and economics.

KEY WORDS : Rice, irrigation regimes, planting geometry, yield, water requirement

Rice consumes 60 per cent of irrigated water to all crops in India. Irrigation one day after disappearance of ponded water gave yields comparable to that of continuous submergence, besides resulting in considerable saving of water applied (Palchamy *et al.*, 1989). There are also reports indicating that irrigation could be withheld for two to three days after disappearance of ponded water without any yield reduction (Subramaniam, 1994). Agronomic measures like planting geometry and number of seedlings $hill^{-1}$ influence the yield components such as number of productive tillers unit $area^{-1}$ and number of filled gains $panicle^{-1}$, which in turn affect the rice yield. Alexander *et al.* (1988) reported that by increasing the spacing from 20 x 10 cm to 20 x 15 cm, grain yield was not significantly altered. Zhang and Huang (1990) reported that grain yield $hill^{-1}$ increased by planting more number of seedlings $hill^{-1}$. Singh and Singh (1992) reported that transplanting 2 or 4 seedlings