betelvine for getting maximum effect of the copper compounds.

Further studies with different methods of application revealed that Bordeaux mixture when applied either in basin formed around the hills or in furrows formed along the hills or in peg holes at lower concentrations (0.5 per cent and 0.25 percent) gave maximum reduction of wilt with increased yield of leaves.

Copper fungicides (both Bordeaux mixture and copper oxychloride) have been proved to be effective in controlling the *Phytophthora* wilt of betelvine by several workers (Subramanian and Venkata Rao, 1970; Anthoni Raj *et al.*, 1973; Narasimhan *et al.*, 1976), which is also in conformity with the present study. Though Bordeaux mixture and copper oxychloride at higher concentration were more efficient in containing the wilt, the cost of chemicals are very prohibitive. In lieu of high cost of chemicals Bordeaux mixture 0.25 per cent at 30 days interval could conveniently be applied by forming basins around the hill or forming furrows along the hills for economical and efficient management of *Phytophthora* wilt of betelvine.

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INFLUENCE OF PROPAGULES, MEDIUM AND SEASON ON ROOTING OF CHRYSANTHEMUM

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ABSTRACT

An experiment was conducted to study the effect of five different types of propagules and two media on rooting of chrysanthemum Co 1. Suckers and terminal cuttings from vegetative shoots recorded higher percentage of rooting, more number of primary and lengthier roots when compared to other propagules. Sand was the best medium for rooting chrysanthemum propagules, while June - July was found to be the best season.

KEY WORDS : Chrysanthemum, Rooting.

Chrysanthemum is one of the most important commercial flower crops of Tamil Nadu. It is cultivated in an area of 1,200 ha in Tamil Nadu, the commercial types being yellow, white with yellow centre and pink with yellow centre. Recently two improved varieties *viz.*, Co 1 and MDU 1 have been released by the Tamil Nadu Agricultural University for commercial cultivation. Generally suckers from the previous crop

are utilised by the farmers as planting materials for raising the main season crop of chrysanthemum. Research work carried out in this crop showed that some of the varieties are shy in suckering behaviour. Hence, a study was conducted to find out the feasibility of using other plant parts for rooting of cuttings in chrysanthemum.

MATERIALS AND METHODS

The present study was carried out in the Department of Floriculture, Tamil Nadu Agricultural University, during 1986-87 using the variety Co 1 chrysanthemum. Five types of propagules were utilised *viz.* terminal cuttings from vegetative shoots (F_1); leaf cuttings from vegetative shoots (F_2); suckers (P_3); terminal cuttings from flowering shoots (P_4) and leaf cuttings from flowering shoots in two media *viz.* sand and pot mixture, containing equal quanitites of red earth, farm yard manure, garden soil, leaf mould and sand. The propagules maintained under partial tree shade were watered twice, once in the morning and again in the evening daily. The experiment was laid out with factorial concept replicated thrice.

RESULTS AND DISCUSSION

The results presents in Table 1 proved that the suckers in general were the ideal propagule materials which registered a mean rooting percentage of 84.44 followed by terminal cuttings from vegetative shoots (77.78). Leaf cuttings from vegetative shoots and leaf cuttings from flowering shoots recorded a mean of 54.45 and 33.61 per cent of rooting respectively. The least rooting of 29.45 per cent was recorded in terminal cuttings from flowering shoots. Larson (1980) has demonstrated in chrysanthemum that juvenile cuttings rooted with ease than matured cuttings. Hartmann and Kester (1976) also reported that the adventitious root formation and flowering were antagonistic to each other owing to the distribution of auxin during

Table 1. The influence of type of propagul, medium and season on percentage of rooting under shade in chryasanthemum cv. Co 1

Season	Terminal cuttings from vegetative shoots (P_1)	Leaf cuttings from vegetative shoots (P_2)	Suckers (P3)	Terminal cuttings from flowering shoots (P4)	Leaf cuttings from flowering shoots (P5)	Mean	Sand	Pot Mixture
August-September	73.33	55.50	93.33	26.67	35.00	56.67	71.33	42.00
October-November	90.00	76.67	93.88	41.67	46.67	70.67	76.00	65.33
December-January	70.00	26.67	66.67	18.33	25.00	41.33	46.67	36.00
February-March	56.67	13.33	53.33	5.00	0.00	25.67	29.33	22.00
April-May	78.33	70.00	95.00	33.33	40.00	63.33	70.67	56.00
June-July	98.33	85.00	100.00	51.67	55.00	78.00	80.67	75.33
Mean	77.78	54.45	84.44	29.45	33.61	55.95	62.45	49.44
Sand	83.33	63.33	86.11	37.78	41.67	62.45		
Pot-mixture	72.22	45.56	82.78	21.11	25.56	49.44		

C.D.at 5% level

Propagule (P)	: 2.550
Medium (M)	: 1.613
Season (S)	: 2.790
P X M	: 3.607
M X S	: 3.951
P X S	: 6.247
P X M X S	: N.S.

flower initiation and development. The present findings are in agreement with above workers.

Among the two media tried, sand recorded higher rooting percentage of 62.45 while the pot-mixture registered only 49.44 per cent rooting. A higher per cent of rooting (86.11) was exhibited in sucker in the sand medium whereas the least rooting per cent (21.11) was found in the terminal cuttings collected from flowering shoots in the pot-mixture medium. Terminal cuttings from vegetative shoots recorded significantly higher percentage of rooting when compared to the cuttings from flowering shoots in both the media. The same trend was found in the leaf cuttings from vegetative shoots and flowering shoots (Table 1). Rees *et al.* (1979) in Edward rose, Jayapal *et al.* (1980) in *Jasminum* species and Singh (1981) in chrysanthemum observed that sand was a better medium for rooting.

The months of June - July recorded a higher percentage of rooting (78.00) followed by October - Novembers (70.67) in the present study. A lesser percentage rooting (25.67) was noticed in February - March season. Cent per cent and nil rooting were recorded in the sucker in the June - July planting and in the leaf cuttings from flowering shoots in the February - March season respectively. Raman *et al.* (1969) found May - June to be the optimum season for planting chrysanthemum. Singh (1981) also observed that planting in July would be conducive for rooting of chrysanthemum. The present investigation has also demonstrated that June - July is the optimum season for rooting of chrysanthemum. The two way interactions between propagule x media, media x season and propagule x season were found significant while the three way interactions were not significant.

Table 2. The influence of type of Propagule, medium and season on number of primary roots under shade in chrysanthamum cv. co1

Season	Terminal cuttings from vegetative shoots (P_1)	Leaf cuttings from vegetative shoots (P_2)	Suckers (P3)	Terminal cuttings from flowering shoots (P4)	Leaf cuttings from flowering shoots (P5)	Mean	Sand	Pot Mixture
August-September	18.83	4.88	27.17	6.67	4.00	12.30	15.40	9.20
October-November	19.00	6.33	28.50	7.50	6.67	13.60	17.07	10.10
December-January	17.83	3.83	25.17	0.00	3.50	10.07	13.07	7.07
February-March	25.33	5.33	31.33	0.00	10.33	14.47	15.67	13.27
April-May	27.50	5.83	40.50	18.83	8.33	20.20	23.67	14.53
June-July	32.50	8.00	48.67	23.00	13.00	24.83	29.93	19.93
Mean	23.50	5.69	33.56	9.33	7.47	15.91	19.13	12.69
Sand	27.88	7.00	39.22	12.17	9.39	19.13		
Pot-mixture	19.11	4.39	27.89	6.50	5.56	12.69		

C.D.at 5% level

Propagule	(P)	: 0.060
Medium	(M)	: 0.040
Season	(S)	: 0.070
P X M		: 0.089
M X S		: 0.153
P X S		: 0.097
P X M X S		: 0.217

Table 3. The influence of type of propagule, medium and season on length of primary roots (cm) under shade in chrysanthemum cv. Co 1

Season	Terminal cuttings from vegetative shoots (P_1)	Leaf cuttings from vegetative shoots (P_2)	Suckers (P3)	Terminal cuttings from flowering shoots (P4)	Leaf cuttings from flowering shoots (P5)	Mean	Sand	Pot Mixture
August-September	10.95	6.50	12.53	5.48	7.00	8.49	9.29	7.70
October-November	12.00	7.53	12.98	5.92	8.53	9.39	10.29	8.50
December-January	10.00	5.48	10.95	0.00	6.55	6.60	7.42	5.77
February-March	12.00	7.00	12.60	0.00	8.02	7.93	8.40	7.46
April-May	13.02	7.47	13.92	6.45	8.55	9.88	10.67	9.09
June-July	13.97	8.65	14.50	7.52	10.03	10.93	11.72	10.15
Mean	11.99	7.11	12.92	4.23	8.12	8.87	9.63	8.11
Sand	12.65	8.03	13.79	4.81	8.87	9.63		
Pot-mixture	11.33	6.18	12.05	3.64	7.36	8.11		

C.D.at 5% level

Propagule	(P)	: 0.367
Medium	(M)	: 0.232
Season	(S)	: 0.402
P X M		: 0.899
M X S		: NS
P X S		: NS
P X M X S		: NS

The suckers produced the large number of primary roots (33.56) whereas the leaf cuttings from vegetative shoots produced the least (5.69). The terminal cuttings from vegetative shoots recorded 23.50 roots whereas the terminal cuttings from flowering shoots produced only 9.33 roots. The number of roots recorded by various progalus differed significantly. Larson (1980) and Singh (1981) in chrysanthemum, Hartmann and Kester (1976) in many ornamental species observed more number of roots in juvenile cuttings. In the present experiment also, suckers produced larger number of roots than terminal as well leaf cuttings of vegetative and flowering shoots.

A great number (39.22) of roots were found in suckers in sand medium whereas leaf cuttings from vegetative shoots in the sand medium produced only sevel roots. In pot-mixture medium the highest (27.89) and lowest (4.39) number of primary roots were found in suckers and leaf cuttings from vegetative shoots respectively. Thus there were significant differences between the propagules raised in different media in the production of roots. Jayapal *et al.* (1980) found larger number of roots in *Jasminum* species under sand medium while Singh (1981) in chrysanthemum similarly observed more number of roots in sand medium.

A greater number of roots (24.83) were found in suckers raised in June - July whereas suckers planted in December - January recorded lower number of roots. Thus there were significant differences for the number of primary roots produced between the propagules, media and season.

In the present investigation the lengthier roots (12.92 cm) were recorded in suckers followed by terminal cuttings from vegetative shoots (11.99 cm). The shortest roots of 4.23 cm were noticed in terminal cuttings from flowering sheets. The length of the primary roots were influenced by the type of propagating material. Both the type

of leaf cuttings (P_2 and P_5) recorded root lengths of 8.03, 8.87, 6.18 and 7.36 cm for sand and pot-mixture media respectively. A longer root length (13.79 cm) was recorded in sucker in the sand medium followed by terminal cuttings from vegetative shoots. Planting during June - July produced longer roots (10.93 cm) followed by April - May (9.88 cm). Thus there were significant differences between propagules and media in respect of length of the roots also.

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RESPONSE OF FINGER MILLET TO MOISTURE REGIMES AND NITROGEN LEVELS

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ABSTRACT

Field experiments conducted at the Tamil Nadu Agricultural University, Coimbatore during Rabi 1985-86 and Kharif, 1986 indicated that irrigating at 0.6 IW/CPE ratio throughout the crop period with an application of 80 kg N/ha was found to be most economical for finger millet Co. 11) grown under vertisols. The quadratic polynominal function with water and N as variables was found to be the best.

KEY WORDS : Finger millet, Moisture, Nitrogen.

Finger millet (*Eleusine coracana* Gaertn.) is an important food crop predominantly cultivated in Karnataka, Tamil Nadu and Andhra Pradesh. Tamil Nadu produces 350 thousand tonnes of grain from an area of 340 thousand hectares. Nearly fifty percent of the area under finger millet in Tamil Nadu is under irrigation (Rachie and Peters, 1977). Water is an important input and a resource that has been developed at enormous cost. Scheduling irrigation to meet the crop demand rather than meeting the crop water requirement will improve the efficiency of this scarce resource. Fertilizer application especially N improves the water use efficiency of crops which however depends on the balance of demand and supply of moisture at the critical stages of growth. Information is very little on N requirement of finger millet in relation to moisture supply.

MATERIALS AND METHODS

An experiment was conducted at the Tamil Nadu Agricultural University, Coimbatore during rabi, 1985-'86 and Kharif, 1986 to study the response of finger millet (Co.11) to moisture regimes and nitrogen.

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