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EFFECT OF GROWTH SUBSTANCES ON ROOTING OF PLANTING MATERIALS IN BLACK PEPPER *(PIPER NIGRUM* L.)

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Abstract: The study revealed that all types of planting materials treated with IBA 1000 ppm were superior with regard to rooting percentage and other root growth parameters such as number, length, fresh weight and dry matter production of roots. Regardless of the growth substance treatments, mist had pronounced influence on root growth in all the planting materials. All types, except laterals, rooted readily during March; but laterals recorded maximum rooting during June. Though there was not much difference among the planting materials with regard to their rooting ability, laterals were shy rooters and produced roots only after six weeks of planting while all the other types produced roots readily within three weeks of planting.

INTRODUCTION

Since large scale multiplication of the cuttings is one of the major critical inputs in the whole production cycle, a lot of attention is required on various aspects of propagation of pepper by cuttings to obtain maximum number of planting materials. The availability of planting materials often limits the extension of planted area. Systematic studies were therefore undertaken to compare the rooting efficiency of different types of planting materials under varying environmental conditions with the aid of growth substances.

MATERIALS AND METHODS

Cuttings were taken from 10 year old healthy vines of black pepper cv. Panniyur 1 maintained under the KADP project in the Main Campus of the Kerala Agricultural University. Cuttings were prepared during March 1987 from four types of shoots viz., runners (stolons), growing shoots (orthotrophs), hanging shoots (geotrophs) and laterals (plageotrophs). Two nodal cuttings were taken from runners (stolons), growing shoots (orthtrophs) and hanging shoots (geotrophs). The leaf blades were removed carefully keeping the base of petiole intact and cuttings were made into bundles of fifty each, for treating with growth substances at various concentrations. In the case of laterals, three nodal cuttings were used for planting. Two growth substances, namely IAA, IBA and their combination and the commercial preparation Seradix B were used in the present study. The experiment was laid out in CRD. Two hundred cuttings were teated with Seradix B, IAA, IBA and IAA+IBA combination, each at 800, 1000 and 1500 ppm concentrations planted under mist and open conditions.

Random samples of20 cuttings each planted under open and mist conditions were uprooted from all the teatments at triweekly interval from March onwards in the case of runners, growing shoots and hanging shoots. But in the case of laterals, the observations were recorded at triweekly intervals from June onwards. Percentage of rooting, number of roots, length of roots, fresh weight of roots, dry weight of roots, fresh weight of shoots and dry weight of shoots, were recorded.

RESULTS AND DISCUSSION

Effect of growth substances on rooting of cuttings

The results of the present study clearly indicated that in the four types of planting materials, the growth substances significantly increased the rooting. Among the growth substances tried viz., Seradix B, IBA, IAA and IAA+IBA combination, IBA at 1000 ppm resulted in maximum success (Tables 1 and 2). The results of the present study thus confirm the earlier findings on pepper (Pillai *et al.*, 1982). In IBA treated cuttings, number, length and weight of the roots increased by more than 100 per cent compared to the untreated cuttings and hence, the treated cuttings developed a good root system which finally resulted in their quick growth and establishment in the main field. The external application of growth substances would have perhaps increased the meristematic activity and root differentiation (Pontikis *et al.*, 1979). The production of more number of roots in auxin treated cuttings is often attributed to the mobilisation of more reserve food materials from the terminal to the basal portion of the cuttings (Strydom and Hartman, 1960). In most of the plant species, sprouting of shoot is an indication of root initiation in cuttings (Hartman and Kester, 1972). However, in pepper from the present study it is observed that the initial sprouts of shoots is not a clear indication of root strike.

In the initial stages, fresh weight of shoot was observed to be maximum in cuttings treated with IAA+IBA 1000 and 1500 ppm and control. However, later on fresh weight was found to be more in cuttings treated with IBA 1000 ppm and Seradix B. The initial set back in shoot growth in the IBA treatment might be due to the enhanced utilization of carbohydrates for root production and the resultant exhaustion of stored carbohydrates in the planting material for shoot growth. Further, the dominance of the auxiliary buds would have been inhibited by the applied auxins at the base of the cuttings. After the roots have been established, they might have started absorbing nutrients from the soil and this accounted for the recoupment of shoot growth rate later in these treatments (Pillai *et al.*, 1982).

Effect of mist on rooting of cuttings

The pooled analysis of the data (Tables 3 and 4) indicated the beneficial effect of mist on rooting of cuttings in the four types of planting materials. The significant effect of mist on rooting of peper cuttings was also reported by earlier workers (Creech, 1955). In the types of planting materials, the superiority of mist was also clearly apparent with respect to other root growth parameters viz., number, length, fresh weight and dry matter production of roots. The beneficial effect of mist could be attributed to the presence of high humidity which prevents desiccation and keeps the cuttings cool thus reducing transpiration and respiration rates. The results in a condition most ideal for rooting and sprouting (Singh, 1980 and Singh and Motilal, 1981).

Mist had a depressing effect on the shoot/root ratio in the final stage. It was clear from the fact that after twelve weeks of planting, higher ratios were observed under open conditions. This reduction in shoot weight under mist during the later stages might be due to the increased leaf fall observed.

Mist held root initiation and

Table 1. Effect of growth substances on the rooting of cuttings (runners and growing shoots)

Treatments	Number of cuttings sampled	Number of cuttings rooted							
		Runners				Growing shoots			
		3WAP	6 WAP	9 WAP	12 WAP	3 WAP	6 WAP	9 WAP	12 WAP
Seradix-B	40	27	30	19	19	15	32	20	20
IAA 1500 ppm	40	26	26	21	18	24	33	17	16
IAA 1000 ppm	40	22	23	13	12	27	26	13	13
IAA 500 ppm	40	15	22	21	12	21	23	15	14
IBA 1500 ppm	40	22	25	20	18	26	35	17	17
IBA 1000 ppp	40	30	33	28	28	33	34	29	29
IBA 500 ppm	40	20	24	14	12	23	27	14	14
IAA + IBA 1500 ppm	40	21	25	20	12	26	28	15	12
IAA + IBA 1000 ppm	40	21	25	18	12	13	20	18	12
IAA + IBA 500 ppm	40	11	25	18	11	13	14	17	10
Control	40	11	20	11	4	295	23	13	9
Chisquare value		37.9"	55.2**	23.8**	19.5	13.77	48.16**	29.42**	44.9

WAP = Weeks after planting

Table 2. Effect of growth substances on the rooting of cutting (hanging shoots and laterals)

Treatments	Number of cuttings sampled	Number of cuttings rooted							
		Hanging shoots				Laterals			
		3 WAP	6 WAP	9 WAP	12 WAP	3WAP	6WAP	9WAP	12 WAP
Seradix-B	40	19	21	19	19	1	22	26	21
IAA 1500 ppm	40	22	24	22	14	3	18	20	18
IAA 1000 ppm	40	14	16	12	10	1	12	14	12
IAA 500 ppm	40	15	18	13	13	0	12	14	13
IBA 1500 ppm	40	21	29	20	17	4	20	22	21
IBA 1000 ppm	40	25	33	26	25	5	28	31	26
IBA 500 ppm	40	22	18	17	14	3	18	18	12
IAA + IBA 1500 ppm	40	16	22	16	12	2	13	10	14
IAA + IBA 1000 ppm	40	9	21	15	11	0	12	16	10
IAA + IBA 500 ppm	40	21	18	15	9	0	11	20	9
Control	40	13	16	11	9	0	4	6	7
Chisquare value		15.15	19.80**	21.58**	43.45**	39.17**	33.08**	25.89**	37.48**

WAP = Weeks after planting

Table 3. Effect of mist on the rooting of cuttings (runners and growing shoots)

Treatments	Weeks after planting	Runners			Growing shoots		
		No. of cuttings sampled	No. of cuttings rooted	Chisquare value	No. of cuttings sampled	No. of cuttings rooted	Chisquare value
Mist	3	220	132	13.13**	220	148	39.68**
Open	3	220	94		220	82	
Mist	6	220	164	24.43**	220	168	17.29**
Open	6	220	114		220	168	
Mist	9	220	125	24.83**	220	114	12.89**
Open	9	220	78		220	74	
Mist	12	220	103	21.64**	220	110	28.20**
Open	12	220	55		220	56	

Table 4. Effect of mist on the rooting of cuttings (hanging shoots and laterals)

Treatments	Weeks after planting	Runners			Growing shoots		
		No. of cuttings sampled	No. of cuttings rooted	Chisquare value	No. of cuttings sampled	No. of cuttings rooted	Chisquare value
Mist	3	220	121		220	11	
Open	3	220	76	18.61**	220	8	0.49
Mist	6	220	135		220	113	
Open	6	220	101	10.50**	220	57	30.06**
Mist	9	220	109		220	117	
Open	9	220	77	3.11	220	88	7.68**
Mist	12	220	101		220	100	
Open	12	220	52	24.05**	220	63	13.34**

development significantly in the four types of planting materials. However, once rooting has taken place, further retention of the cuttings in the mist chamber does not appear to be conducive for pepper since the incidence of diseases was more.

Rooting of cuttings in different types of planting materials

The present study was caried out using four different types of planting materials viz., runners, growing shoots (orthotrophs), hanging shoots (geotrophs) and laterlas (plageotrophs). From the results, it could be seen that there was not much difference among the planting materials with regard to their rooting ability. Though laterals were found to be shy rooters in the initial stages, they could also be used as planting materials as they produced dwarf bushy plants.

The enhanced sprouting and rooting observed when planting was done from March to June and the poor rooting during the winter season from November to February, could be explained as due to bud dormancy. The break of dormancy in March might be due to the mobilization of starch because of the enhanced auxin content (Shathamalliah *et al.*, 1974). The failure of laterals to root during March might be due to the lack of food reserves in the cuttings as they were taken immediately after harvest. During the flushing season i.e., during June, the lateral cuttings also rooted satisfactorily.

In the planting materials, the initial rooting recorded a higher percentage, while ultimately the percentage of establishment showed a reduction. This would indicate that in pepper there are factors which interfere in the growth of roots after the initial root strike. Lack of production of sufficient numbr of roots or the improper development of roots and vigorous vegetative growth could be the reason attributed to this phenomenon. Moreover, pepper roots in the initial stages are prone to fungal pathogens resulting in poor establishment. Identifying the factors responsible for the reduction in the establishment of rooted cuttings will be helpful to obtain maximum success in rooting of cuttings.

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