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Vegetative Propagation of Chickpea (*Cicer arietinum* L.) Through Stem Cuttings

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Abstract: Chickpea stem cuttings were used for vegetative propagation to multiply wild *Cicer* species and F_1 hybrids produced from intraspecific hybridization. Stem cuttings of three varieties were treated with different concentrations of root inducing hormones NAA and IAA to compare and standardize the optimum concentration of these hormones. Three different concentrations (0.25, 0.5 and 1 mg l^{-1}) of NAA induced 100 % rooting within ten days in all varieties. Wild *Cicer* species and F_1 hybrids with less number of seeds were treated with 0.5 mg l^{-1} of NAA. About 10-13 plants were produced from every F_1 seed. All plants performed well in the field and produced sufficient quantity of seed.

Key words: Chickpea, stem cuttings, vegetable propagation, hybrids, NAA, IAA

Introduction

Chickpea (*Cicer arietinum* L.) is the most important grain legume crop of Pakistan. Improvement work is in progress at Nuclear Institute for Agriculture and Biology Faisalabad, for the development of high yielding and disease resistant varieties of chickpea. Genetic variability is created by the use of induced mutation and hybridization. The hybridization in chickpea is tedious and pod setting by artificial hybridization is only of the order of 15-25 % (Maesen and Van der, 1972). In many cross combinations only 1-2 % seed setting has been observed. Vegetative propagation is one of the techniques to multiply less number of seeds and may be successfully utilized in those cross combinations having very few seeds to obtain sufficient quantity of F_1 seed for raising a large F_2 population. Many researchers have tried different techniques for propagation of chickpea and wild *Cicer* species that are difficult to grow or with poor seed yield (Rupela and Dart, 1981; Rupela 1982; Davis *et al*., 1982; Bassiri *et al*., 1985). Cent percent rooting of 1 cm long shoots of Mammillaria elongate, under non-sterile conditions, has been reported by Jhonson and Emino (1979).

The objectives of this study were to standardize a technique for vegetative propagation of chickpea and utilization of this technique to facilitate the multiplication of F_1 hybrids obtained from intraspecific crosses, and wild *Cicer* species.

Materials and Methods

A preliminary experiment was conducted to find out the suitable root-inducing hormone and it's optimum concentration required for rooting of stem cutting in chickpea. 3-5 day old seedling of three varieties viz. CM 72, CM 88 and CM 98 were taken and divided into two groups. Both the groups were treated with three different concentrations of growth hormones i.e., 0.25, 0.5 and 1.0 mg l^{-1} of NAA and IAA. 3-4 cm long shoots were treated with slight modification in the protocol given by (Kyte and Briggs, 1979). In group 1, cuttings were covered with talc and planted in pots containing sand wet with different concentrations of root inducing hormones (NAA and IAA) to see the effect of talc treatment on root induction. While in-group 2 stem cuttings were not treated with talc. Stem cuttings kept as control were treated with water only. Pots were kept in growth chamber at 25±1°C with 18h light and 6h darkness and were treated daily with few ml of IAA and NAA solutions. Observations were made at an interval of 5, 10 and 15 days with regard to rooting. When the roots started appearing these plantlets were treated with ¼ strength Hoagland solution for about one week. These plantlets were kept in the pots and placed in the field for about one month. Finally they were transferred to soil in the field for further growth.

Stem cuttings of F_1 hybrids from 26 intra varietal crosses of *Cicer arietinum* and two accessions each of *C. judiacum* and *C. pinatifidum* were tested for root induction. 3-5 days old stem cuttings were treated with root inducing hormone and kept in the growth chamber at 25±1°C. After about 10 days these plantlets were given ¼ strength Hoagland solution for further strengthening. Finally these plantlets were transferred to field for pod setting and seed production.

Results and Discussion

Chickpea is an easy rooting species. Stem cuttings in all the three varieties rooted within 10 days. Three different concentrations of NAA i.e., 0.25, 0.5 and 1.0 mg l^{-1} induced 100% roots in all the three tested varieties (Fig. 1). Bassiri *et al*. (1985) have reported that 0.4-1 mg l^{-1} of IAA is required to induce rooting in chickpea varieties while our results have revealed that in case of IAA, rooting ranged from 20-100 % in the tested varieties. All the varieties namely CM 72, CM 88 and CM 98 also rooted in water

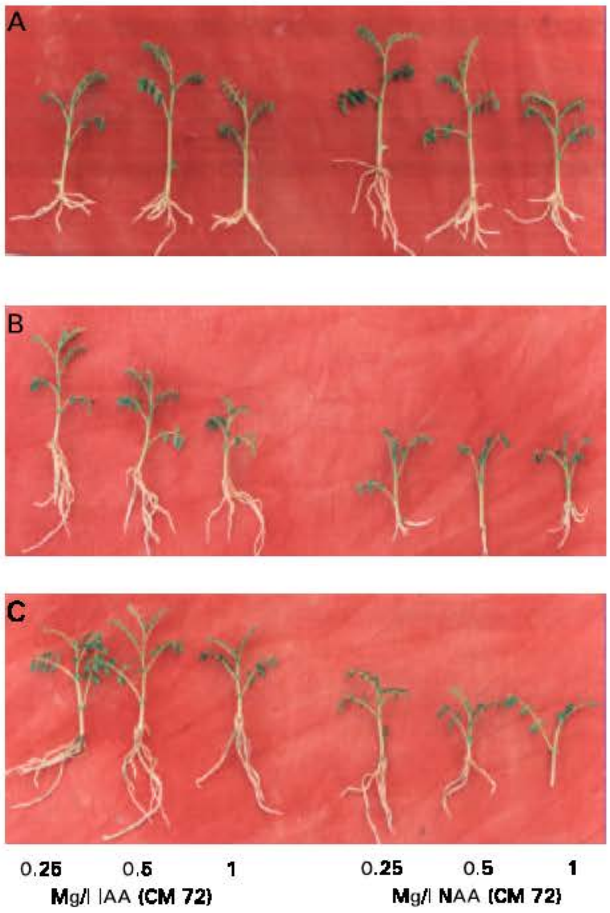

Fig. 1: Comparison of root inducing hormones NAA and IAA in three different varieties of Chickpea variety viz. CM 72 (1a), CM88 (1b) and CM98 (1c)

but the root length and number of roots were few as compared with the hormones treated plants (Table 1). Statistical analysis of data showed that NAA proved better hormone than IAA. However different concentrations in both the hormones did not differ significantly (Table 2). Due to this reason the lower concentrations of NAA was used for induction of roots in F_1

Table 1: Effect of auxins on rooting number and root length in stem cuttings of three varieties of chickpea (a = with talc, b = without talc)

Treatment (mg l^{-1})		Rooting (%)						Root number						Root length (cm)					
		CM72		CM88		CM98		CM72		CM88		CM98		CM72		CM88		CM98	
		a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
IAA	0.25	100	100	60	0	80	0	7	5.5	2.8	0.0	3.2	0.0	3.5	5.0	2.5	0.0	5.5	0.0
IAA	0.5	100	100	40	80	80	85	5.8	4.7	1.2	2.6	4.0	3.8	2.5	5.0	0.5	0.6	3.0	5.0
IAA	1.0	100	100	40	0	0	0	6.4	4.6	2.2	0.0	0.0	0.0	2.5.	5.0	2.0	0.0	0.0	0.0
NAA	0.25	100	20	100	0	100	0	7.0	0.8	7.0	0.0	5.0	0.0	4.0	1.5	5.5	0.0	5.0	0.0
NAA	0.5	100	40	100	0	100	0	6.8	1.8	5.4	0.0	5.0	0.0	3.0	1.0	3.5	0.0	7.0	0.0
NAA	1.0	100	80	100	0	100	0	7.2	2.2	6.4	0.0	4.8	0.0	3.0	0.5	4.0	0.0	4.0	0.0
Control		40		14		20		1		0.4		0.2		0.7		0.2		1	

Table 2: Effect of different concentration of two hormones on root number in chickpea

Treatment		Root number	
		With talc	Without talc
IAA	0.25	4.333B	1.800C
IAA	0.5	3.667B	4.733A
IAA	1	3.933B	1.533C
NAA	0.25	6.333A	0.6267D
NAA	0.5	5.733A	2.600B
NAA	1	6.133A	2.66B
Control			0.533D
L.S.D. at 5%		1.030	0.5291

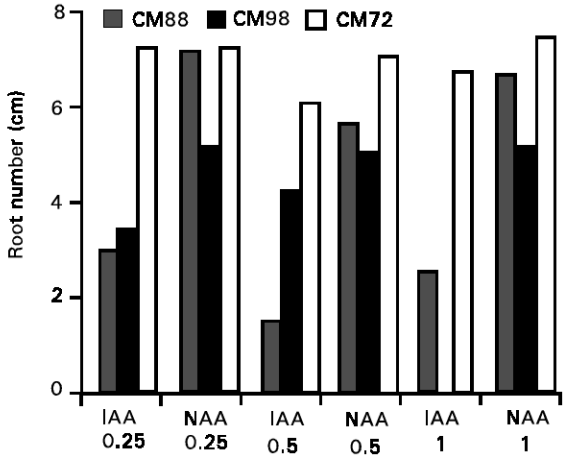

Fig. 2: Relationship between root number and three different concentration of IAA and NAA in three different varieties of chickpea

hybrids. The results have also been shown as a bar diagram (Fig. 2). Kyte and Briggs (1979) treated basal cut end of the shoot of Rhododendron in a standard rooting powder or IBA in talc and planted in a potting mix, in vitro developed shoots root equally well *in vivo* and *in vitro*. The stem cuttings of group 1 that was covered with talc before planting in sand rooted properly. While those of Group II either did not produce any root and their cut ends initially dried and then stem eventually died, or if produced roots, their number was less and length was very short. Only CM 72 gave 100 % roots with all the concentrations of IAA (Table 1), which showed that production of roots is dependent upon genotype. Development of roots in group 1 might be due to the reason that talc covered the cut end of stem and maintained its moisture, the stem cuttings absorbed root-inducing hormone and started bulging from the cut end and developed roots. Rupela and Dart (1981) worked on vegetative propagation from wounded branch of chickpea for root growth but the results were with 20-50 %success, thereafter they treated these rootless with nutrient solution containing 100-ppm nitrogen. After about 10 days more than 70 % of the branches with swelling at the wound formed roots and grew into plant. Davis *et al*. (1982) also tried full strength nutrient solution for rooting in chickpea. But the problem with using nutrient solution is that it encourages the growth of algae, which leads to decay, and death of cuttings. In this experiment, treatment of stem cuttings with ¼ strength Hoagland solution for about one week strengthened the roots and increased their length. Transferring these plantlets to pots and placing the pots in the field further strengthened the roots of these plants. Plants of all the three varieties grew well in the field and produced pods full of seed. Stem cuttings of F_1 hybrids and wild species of *Cicer* also developed roots with root inducing hormone (NAA, 0.25 %). 10-13 plants were produced from a single seed of F_1 hybrid and they grew well in the field and produced pods with sufficient number of seeds.

The results have revealed that NAA was the better root-inducing hormone for *Cicer arietinum* than IAA and is required in very low concentration i.e., 0.25 mg l^{-1}, however the cut ends should be covered with talc to get maximum root number and length.

References

Bassiri, A., A. E. Shrikand and F. Ahmad, 1985. Rooting of stem cuttings in Cicer International Chickpea Newsletter, 13: 10-11.

Davis, T. M., K. Ken and W. Foster, 1982. A method for rooting chickpea cuttings. International Chickpea Newsletter 7: 6-8.

Johnson, J. L. and E. R. Emino, 1979. *In vitro* propagation of *Mammillariaelongata*. Hort. Science, 14: 605-606.

Kyte, L. and B. Briggs, 1979. A simplified entry into tissue culture production. Proc. Int. Plant Prop. Soc., 29: 90-95.

Maesen, L. J. G. Van Der, 1972. *Cicer* L., a monograph of the genus, with special reference to the chickpea (*Cicer arietinum* L.), its ecology and cultivation. Wageningen, H. Veenman and Zonen, N. V. Also as Meded. Landbhogesh. Wageningen 72010: 342.

Rupela, O. P., 1982. Rooting chickpea cuttings from field-grown plants. International Chickpea Newsletter, 7: 9-10.

Rupela, O. P. and P. J. Dart, 1981. Vegetative propagation of chickpea. International Chickpea Newsletter, 4: 12-13.