STUDIES ON ORCHIDS OF NORTH-EAST INDIA : METABOLISM AND GROWTH FACTOR REQUIREMENTS OF SEED GERMINATION

ABSTRACT

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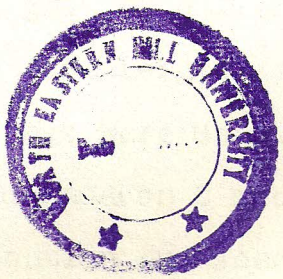

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Different media viz., Knudson C, Pfeffer's and Vacin and Went were tried for *in vitro* seed germination and seedling growth of *Cymbidium elegans* and *Coelogyne punctulata*. The Knudson C medium was found better for seed germination and seedling growth of both the species. The orchid seeds were considered germinated upon the emergence of embryo from the testa. To quantify the seedling growth, different parameters like the average leaf and root length, their number as well as fresh weight of the seedlings were used. Different growth factors were incorporated into Knudson C medium to assess their influence on seed germination and seedling growth.

Using different concentrations of various carbon sources added separately in the medium, lower concentrations (20 g/l and 30 g/l) of sucrose, D-fructose and D-glucose were found suitable for seed germination and seedling growth of both the species. While moderate growth was recorded using trehalose, maltose, D-mannose and raffinose, the growth was poor when L-glucose and L-mannose were present in the medium. In sugar-free medium, very poor seed germination and seedling growth were noticed.

The nitrogen sources increased seed germination and seedling growth in both the species at lower concentrations. However, higher concentrations were found inhibitory. The optimum seed germination and seedling growth resulted in

medium containing 0.5 g/l calcium nitrate. Ammonium nitrate, potassium nitrate, sodium nitrate and sodium nitrite added separately in the medium, resulted in lower germination and seedling growth.

While biotin, thiamine HCl and nicotinic acid added separately in the medium were found promotive for the germination and seedling growth of C. elegans and C. punctulata, the optimum values were recorded using a mixture of thiamine HCl, pyridoxine HCl, nicotinic acid and biotin in the medium.

The different growth regulators added separately in the medium significantly influenced the germination and seedling growth of C. elegans and C. punctulata. NAA (0.5 mg/l), GA_3 (0.5 mg/l) and kinetin (0.1 mg/l) significantly increased seedling growth in C. elegans, whereas it was higher in case of C. punctulata using NAA (0.1 mg/l) and kinetin (0.5 mg/l). In case of C. punctulata, the seedling growth alone was quite poor using IAA and GA_3. Kinetin (0.1 mg/l) enhanced seed germination in both the species. 2,4-D was inhibitory for seed germination and seedling growth in both the species. At higher concentrations, it resulted in callus like mass. The optimum results were recorded using 0.5 mg/l of GA_3 in the medium for seedling growth of C. elegans and 1.0 mg/l of kinetin in conjunction with 0.1 mg/l of NAA for C. punctulata.

Addition of bark powder in the medium had significant promotive effect on seedling growth of both the species at lower concentrations, whereas higher concentrations were found inhibitory. While the seed germination in C. punctulata was slightly higher using the bark powders, it was inhibited in C. elegans. For seedling growth in both the species, incorporation of S. glomerata bark powder was the best followed by Q. dealbata, A. labigata and P. kingii.

Banana homogenate significantly increased the seed germination and seedling growth of C. elegans and C. punctulata. Banana homogenate at 75 g/l in the medium resulted in optimum germination and seedling growth of both the species.

Using RH39 strain of mycorrhizal fungi, the seed germination and seedling growth were slightly enhanced in case of C. punctulata. However, in case of C. elegans the seed germination was inhibited by both RH39 and RH54 strains of the mycorrhizal fungi used, excepting an increase in the seedling growth.

Qualitative determinations of amino acids, sugars and phenols were done in the bark extracts of S. glomerata, P. kingii, A. labigata and Q. dealbata. The maximum number of amino acids and phenols were detected in the bark extract of P. kingii and A. labigata followed by Q. dealbata and

S. glomerata. The maximum number of sugars were detected in the bark extract of S. glomerata followed by Q. dealbata, A. labigata and P. kingii. Amongst the different amino acids, sugars and phenols detected in the bark extracts, some are known to serve as promotive and others as inhibitory for seed germination and seedling growth.

In C. elegans, the activities of peroxidase, polyphenol oxidase and IAA-oxidase were higher in all the growth regulators and bark powder treatments, except in case of seedlings grown on 2,4-D and P. kingii bark powder containing media. In case of P. kingii bark powder treatment, only the polyphenol oxidase activity was less. The activities of the three oxidative enzymes mentioned above were higher in C. punctulata seedlings subjected to different treatments. The exceptions being seedlings of C. punctulata grown on media containing IAA, 2,4-D and P. kingii bark powder for peroxidase; A. labigata and P. kingii bark powders for polyphenol oxidase; and IAA, 2,4-D and P. kingii bark powders for IAA-oxidase.