



Assessment of culture medium without commercial ammonium nitrate for in vitro culture of industrially important plant species

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Abstract

Ammonium nitrate (AN) is one of the major nitrogen sources of Murashige and Skoog (MS) medium. It is prohibited in various countries, including India because it is used in explosive manufacturing. Since MS is the most successful medium used for in vitro culture of many plant species, an attempt was made to achieve the composition of MS medium using ammonium hydroxide and nitric acid as an alternative to AN. This acid–base neutralization product AN, was further characterized by ATR-FTIR spectroscopy. Micropropagation of *Musa acuminata* cv ‘Grand Naine’ was tested using the alternate MS medium (AMS) and good mean shoot number was achieved. Shoot proliferation of *M. acuminata* cv ‘Grand Naine’ on AMS was significantly better than on normal MS medium. A 1-year production cycle of *M. acuminata* cv ‘Grand Naine’ was successfully accomplished with seven successive subcultures and rooting on AMS medium followed by satisfactory acclimation. To check broad cross-species utility of AMS for shoot proliferation, a range of species including *Chlorophytum borivilianum*, *Dalbergia sissoo*, *Dregea volubilis* and *Plumbago zeylanica* were tested. The in vitro shoot multiplication rate of these species on AMS was statistically not different from MS medium. These results indicate that AN can be replaced with ammonia hydroxide and nitric acid in preparing MS-based medium, without negatively affecting shoot proliferation/ rooting and it would be cost-effective too for micropropagation operations in comparison to commercially available MS medium.

Key message

Commercial NH_4NO_3 could be replaced with HNO_3 and NH_4OH in tissue culture medium to follow the explosive regulations and was efficient for in vitro culture of various plant species.

Keywords Banana · FTIR · Micropropagation · Murashige and Skoog medium · Nitrogen source · Tissue culture

Abbreviations

AN Ammonium nitrate
BA 6-Benzyleadenine
IAA Indole-3-acetic acid
IBA Indole-3-butyric acid
NAA Naphthalene acetic acid

AMS Alternate MS medium
MS Murashige and Skoog medium

Introduction

If a plant is recognized as a target of research for commercialization, conservation or for both purposes, understanding its growth requirements is of supreme importance (Moyo et al. 2011). The chemical composition of a plant tissue culture medium plays a significant role in the success of in vitro propagation (Phillips and Garda 2019). Plants fulfil their nitrogen requirements primarily in the form of nitrate (NO_3^-) and ammonium (NH_4^+) (Zhang et al. 2019). The sub-optimal nutrient medium may cause disorders or death of cultures (Nas and Read 2000; Iovinella et al. 2020). Nowadays, micropropagation technology is extensively applied in the production

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