

UNIVERSITI TEKNOLOGI MARA

***IN VITRO* SEED GERMINATION
AND ELICITATION OF TOTAL
PHENOLIC AND FLAVONOID
CONTENT IN *TRIGONELLA*
*FOENUM-GRÆCUM***

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MSc

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Trigonella foenum-graecum is an important leguminous plant which exhibits numerous pharmacological properties due to the presence of many important plant secondary metabolites. However, the recalcitrant nature of this plant accounts for major drawbacks in propagation of the plant *in vitro* which justifies the need to test different approaches of propagating this plant *in vitro*. Hence, this study reports the effects of BAP and NAA on *in vitro* seed germination of *Trigonella foenum-graecum* and the effect of salicylic acid and yeast extract elicitors on total phenolic (TPC) and flavonoid content (TFC) and ultimately antioxidant activity of *in vitro* grown plantlets. Seeds were cultured on MS media with various concentration of BAP and NAA (0-2 mg/L) added singly and in combinations. Germination percentage, shoot length, number of leaves and root length was recorded weekly for 5 weeks, and a final mean of each parameter was taken. Findings showed that 2.0 mg/L BAP produced the highest response in all parameters studied. The germination percentage, shoot length, number of leaves and root length were 93.33±3.18%, 3.25±0.07cm, 13.73±0.18, 1.12±0.01cm respectively. After 5 weeks' culture, plantlets were subcultured on MS media supplemented with BAP 2.0 mg/L treated with various concentrations of salicylic acid (100-400 mM) and yeast extract elicitors (5-20 mg/L) for 48 hours. The control was not induced with any elicitors. The plantlets were then oven-dried and extracted using methanol by rotary evaporation and tested for antioxidant activity, total phenolics and flavonoids. With salicylic acid, 100 Mm concentration produced the highest response in antioxidative activity (89.84±0.10%) and yielded the highest TPC (16.55± 0.21 mg GAE/g extract) and TFC (58.89± 4.29 mg QE/g extract). Yeast extract of 10 mg/L yielded the highest TPC (15.88± 0.13 mg GAE/g extract) and TFC (56.60± 2.79 mg QE/g extract) while yeast extract of 5 mg/L produced a higher antioxidative capacity (81.17±0.95%). A strong correlation was found between the DPPH scavenging activity and total phenolic content ($r^2= 0.913$) and total flavonoid content ($r^2= 0.926$) with salicylic acid. Meanwhile, plant extracts treated with yeast extract also exhibited a strong correlation between the DPPH scavenging activity and total phenolic content ($r^2= 0.950$) and total flavonoid content ($r^2= 0.844$). *Trigonella foenum-graecum* plantlets exhibited remarkable antioxidant capacity upon elicitation with lower concentrations of salicylic acid and yeast extract. The results suggest that salicylic acid and yeast extract played a vital role in the signal transduction process that stimulates phenylpropanoid biosynthesis and regulates the expression of defence genes in plants leading to the production of total phenolics and flavonoids. Hence it was concluded that low concentrations of SA and YE could effectively be used as potent elicitors to enhance the synthesis of total phenolic and flavonoid compounds *in vitro* *T. foenum-graecum* plantlets.

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