

In Vitro Induction of Multiple Shoots and Plant Regeneration in Brinjal (*Solanum melongena* L.): Influence of Plant Growth Regulators and Pesticide Exposure

Dr. Dasari Sammaiah

Kakatiya Government College (A), Hanumakonda, Telangana, India, 506009

Corresponding Author Email: [ds.dasari1234\[at\]gmail.com](mailto:ds.dasari1234[at]gmail.com)

Abstract: *An efficient in vitro regeneration system is important for rapid propagation and future improvement of brinjal (*Solanum melongena* L.). This manuscript summarizes multiple-shoot induction and plant regeneration observations from the supplied experimental material, with particular attention to the effects of Rogor. The photographic captions identify a control shoot-induction medium containing 0.5 mg L⁻¹ indole-3-acetic acid (IAA) and 3.0 mg L⁻¹ benzyladenine (BA), while the tables report responses at 25, 50, 75, 100, and 150 ppm. In the control, 90% of cultures responded, with a mean of 11.5 shoots. Under Rogor treatment, response declined from 78% at 25 ppm to 30% at 150 ppm, while mean shoot number declined from 11.0 to 4.3. The supplied photographs also document shoot-bud development, root formation in control cultures, and acclimatization of a regenerated plantlet. Overall, the recorded data indicate a concentration-associated decline in shoot induction and shoot number for all three treatments, with the strongest reduction in the reported high-concentration Rogor treatment. These observations are descriptive; formal comparisons among compounds require the original replicate-level data and confirmation of the reported standard errors. Historical pesticide names and concentrations are reported only as part of the source record and are not recommendations for current use.*

Keywords: *Solanum melongena*; in-vitro regeneration; multiple-shoot induction; plant tissue culture; benzyl adenine; indole-3-acetic acid; pesticide-associated inhibition

1. Introduction

Brinjal (*Solanum melongena* L.), also known as eggplant or aubergine, is an economically important vegetable crop cultivated throughout tropical and subtropical regions. Reliable in vitro regeneration can support rapid clonal propagation, germplasm conservation, and plant biotechnology applications, including transformation and crop-improvement research [1]. The success of regeneration depends on genotype, explant type, physiological age, basal medium, plant growth regulators, culture conditions, and the ability of developing shoots to root and acclimatize.

Plant tissue culture relies on the interaction between auxins and cytokinins to regulate cell division, callus formation, shoot initiation, and root development. Cytokinins such as benzyladenine (BA) are commonly used to promote axillary or adventitious shoot formation, while auxins such as indole-3-acetic acid (IAA) may support growth and rooting depending on concentration and tissue context [2-3]. The optimal combination is not universal and must be established for each genotype and explant.

Chemical exposure can interfere with plant growth and developmental processes. In vitro cultures are useful for observing these responses under controlled conditions because the medium and exposure level can be defined [4]. However, pesticide effects observed in culture should not automatically be interpreted as field-level toxicity; culture media, exposure routes, chemical formulations, and exposure durations differ from agricultural conditions. Historical product names such as Rogor and Kitazin may refer to particular formulations or active ingredients, so their

identities should be verified from original laboratory records before scientific or regulatory interpretation [5-6].

The supplied experimental tables compare the induction of multiple shoots in control cultures and cultures treated with Rogor at 25-150 ppm. The associated plates illustrate multiple-shoot development, reduced shoot-bud formation at higher treatment concentrations, root induction in control material, and acclimatization of a plantlet. The objective of this paper is to organize these observations into a coherent report, quantify the descriptive trends visible in the supplied tables, and discuss their relevance to in vitro shoot induction and regeneration in *S. melongena*.

2. Materials and Methods

2.1 Plant Material and Culture System

The supplied material concerns in vitro cultures of *Solanum melongena* L. (brinjal). The photographs document shoots and shoot buds developing on culture medium and a regenerated plant transferred to a pot for acclimatization. The full original protocol for explant source, surface sterilization, basal medium composition, culture initiation, and transfer schedule was not included with the tables supplied for this manuscript. These details should be inserted from the original laboratory notebook or thesis before journal submission.

2.2 Shoot-Induction Medium

The caption accompanying the shoot-induction image identifies the control medium as MS medium supplemented with 0.5 mg L⁻¹ IAA and 3.0 mg L⁻¹ BA. This formulation is

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therefore recorded as the reported control condition. Medium pH, sucrose concentration, gelling agent, sterilization parameters, incubation temperature, light intensity, and photoperiod should be verified from the original protocol rather than inferred.

2.3 Treatment groups and concentrations

Separate treatment series were reported for Rogor, Endosulfan, and Kitazin at 25, 50, 75, 100, and 150 ppm, alongside an untreated control. Each table states that 40 cultures were maintained per treatment. The supplied tables list percentage response and mean number of shoots $\pm$ SE. Because the material appears to describe historical pesticide treatments, the compound identities, active ingredients, formulation basis, and concentration units should be verified. This manuscript records the historical observations and does not recommend preparing or using these pesticides.

2.4 Response variables

The response variables were (i) percentage of cultures showing a shoot-induction response and (ii) average number of shoots per culture, reported as mean $\pm$ standard error (SE). The photographs were used qualitatively to describe shoot buds, multiple shoots, root formation in control cultures, and a potted acclimatized plantlet. No additional measurements were extracted from the images.

2.5 Data presentation and statistical limitations

Values in the results table below are transcribed from the supplied images. Trends are described using the reported values. Raw replicate-level data and the statistical test used in the original work were not provided; therefore, no new

significance tests were performed and no claim of statistically significant differences is made. The SE values have been retained as printed and should be checked against the original source because their precision and calculation cannot be independently validated from summary tables alone.

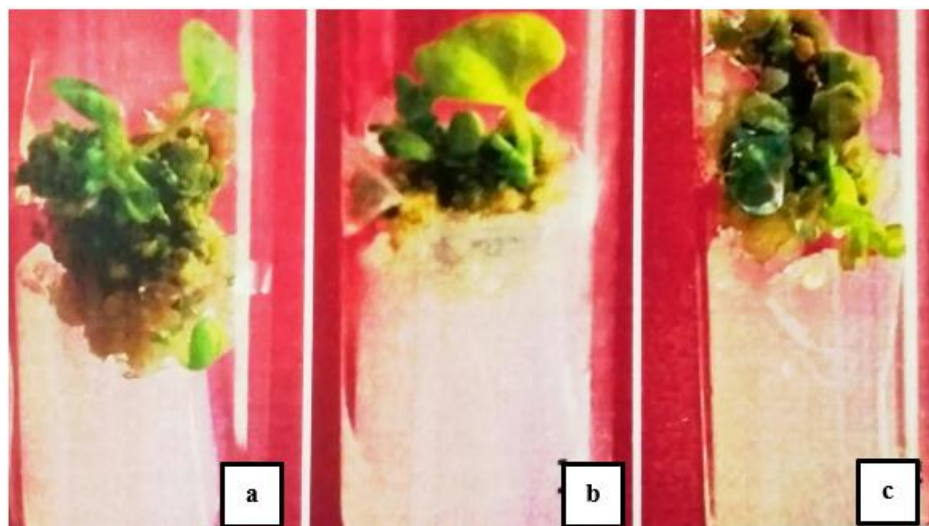
3. Results and Discussion

3.1 Multiple-shoot induction in control cultures

The control cultures showed a 90.0% response and a mean of 11.5 ± 0.035 shoots, according to the supplied tables. The image caption attributes control shoot induction to MS medium containing 0.5 mg L⁻¹ IAA and 3.0 mg L⁻¹ BA. The high response in the control provides the reference against which the treated cultures were compared. The associated plate also shows root induction in control material and a plantlet after approximately 30 days of acclimatization, indicating that regeneration extended beyond the initial appearance of shoot buds [7].

3.2 Effect of Rogor on multiple-shoot induction

Rogor-treated cultures showed a progressive reduction in response as concentration increased. The response declined from 78.0% at 25 ppm to 44.0% at 100 ppm and 30.0% at 150 ppm. Mean shoot number declined from 11.0 ± 0.0376 at 25 ppm to 6.2 ± 0.0431 at 100 ppm and 4.3 ± 0.0742 at 150 ppm. Relative to the control mean of 11.5 shoots, the 150 ppm treatment was associated with an approximately 62.6% lower mean shoot number. These data show a clear descriptive concentration-associated reduction in shoot induction and shoot proliferation [8-9].



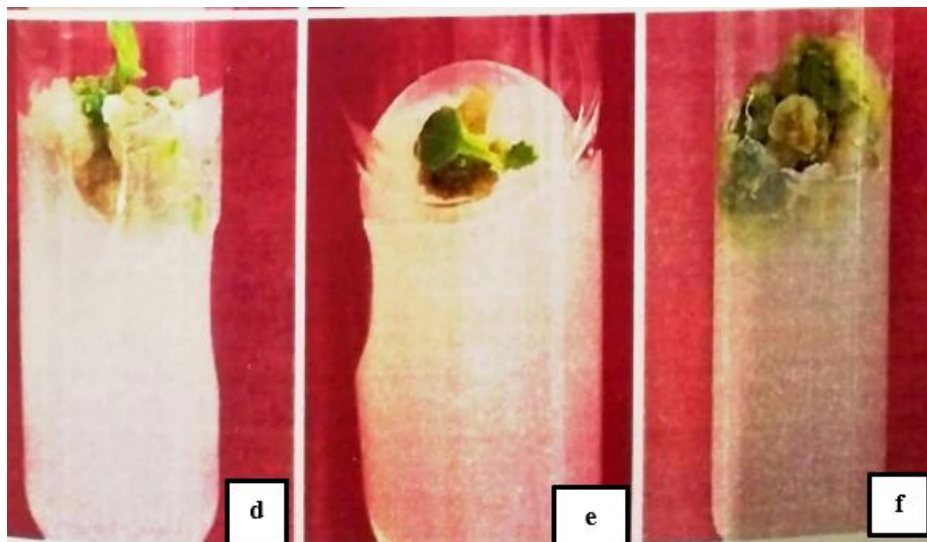


Figure (a): Multiple shoot induction on MS media supplemented with 0.5 IAA + 3.0 mg/L BA.

Figure (b), (c), (d), (e) & (f) Induction of multiple shoot buds and shoots from low to high concentrations of Rogor at 25, 50, 75, 100 & 150 ppm, respectively.

Table 1: Induction of multiple-shoot by the addition of Rogor

Treatment	Concentration (ppm)	Cultures maintained	Response (%)	Mean shoots $\pm$ SE
Control	0	40	90.0	11.5 $\pm$ 0.035
Rogor	25	40	78.0	11.0 $\pm$ 0.0376
Rogor	50	40	70.0	10.2 $\pm$ 0.478
Rogor	75	40	58.0	8.5 $\pm$ 0.0492
Rogor	100	40	44.0	6.2 $\pm$ 0.0431
Rogor	150	40	30.0	4.3 $\pm$ 0.0742

3.6 Regeneration and acclimatization

The photographic plates document multiple shoots and shoot buds in cultures, root formation in control samples, and a regenerated plantlet growing in a pot after approximately 30 days [10]. These images support the observation that some in vitro shoots proceeded to rooting and acclimatization. Nevertheless, the source material does not provide a numerical rooting percentage, survival rate after transfer, or longer-term growth assessment [11-13]. A complete regeneration study should quantify rooting frequency, roots per shoot, root length, survival after hardening, and subsequent growth under greenhouse or field conditions [14-15].

4. Conclusion

The supplied data indicate that multiple-shoot induction in brinjal (*Solanum melongena* L.) was highest in the control cultures maintained on MS medium supplemented with 0.5 mg L⁻¹ IAA and 3.0 mg L⁻¹ BA. Across the reported Rogor, treatment series increasing concentration was associated with lower percentages of responding cultures and fewer shoots per culture. At 150 ppm, and mean shoot number (1.4), followed by Rogor (30%; 4.3 shoots). The images further document root formation and acclimatization of a regenerated plantlet. These results are descriptive and should be validated with the original raw data and statistical analysis. Future work should clearly identify active ingredients, report complete culture conditions, include replicated quantitative measurements, and assess rooting and post-transfer survival.

Historical pesticide treatments should not be interpreted as recommendations for current agricultural or laboratory use.

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