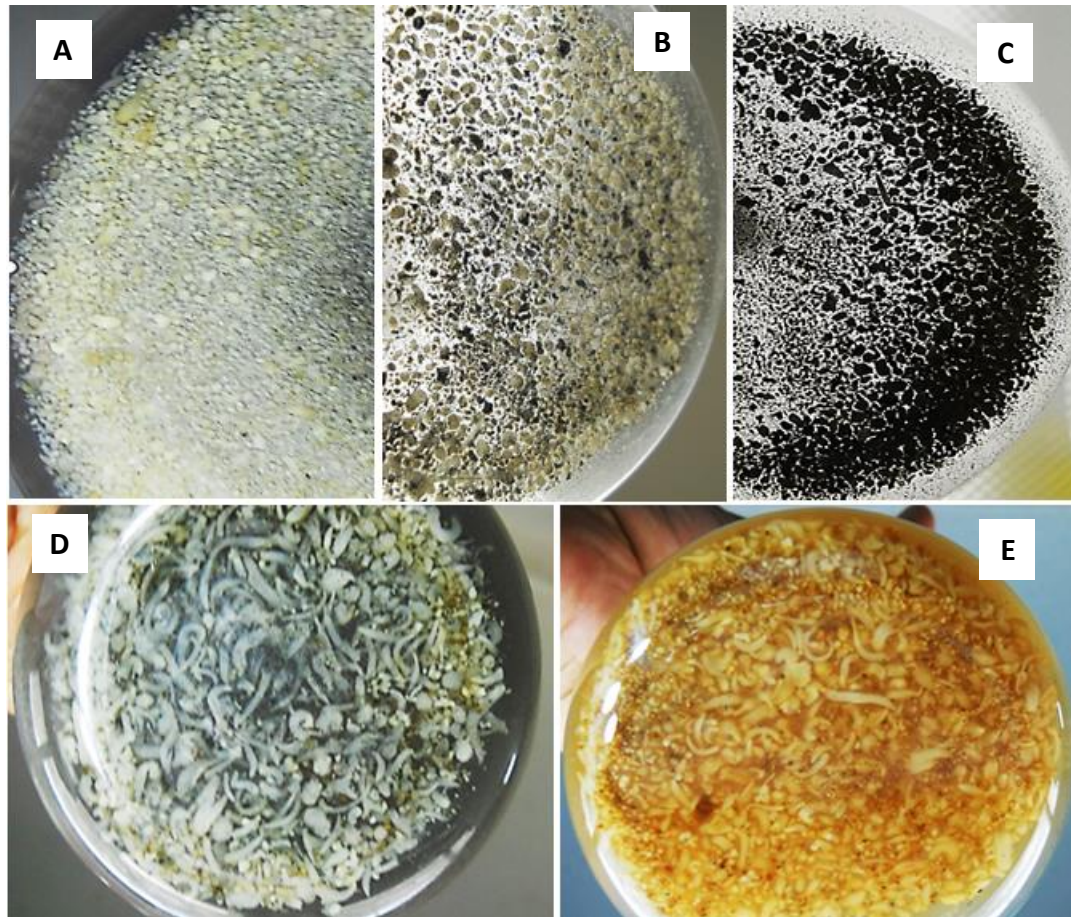
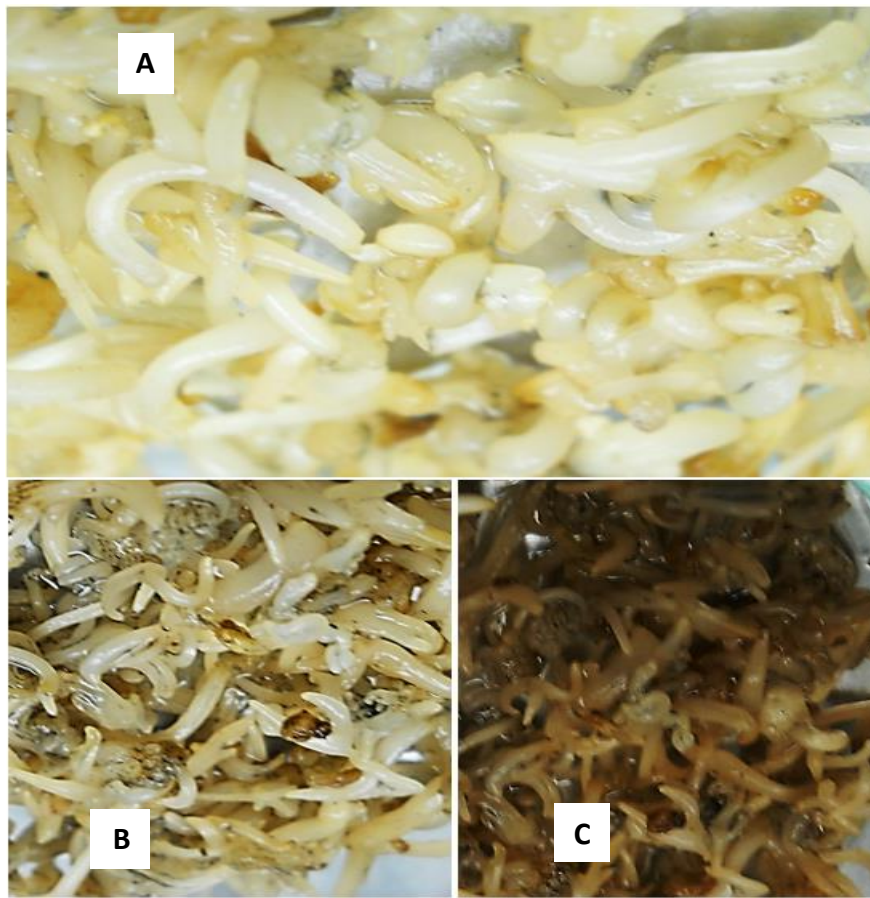


## Figures



**Fig. 1:** Effect of activated charcoal on biomass accumulation, browning intensity and phenolics content in the cell suspension cultures.

- A. Globular embryos stage with 150 mg/L charcoal in the 3rd week of culture.
- B. Globular embryos stage with 200 mg/L charcoal in the 3rd week of culture.
- C. Globular embryos stage with 300 mg/L charcoal in the 3rd week of culture.
- D. Cotyledonary embryos stage with 150 mg/L charcoal in the 6th week of culture.
- E. Cotyledonary embryos stage without charcoal in the 6th week of culture.



**Fig. 2:** Effect of subcultures number on biomass accumulation, browning intensity and phenolics content in the somatic embryo of cell suspension cultures.

- A. Somatic embryos that subculture every weekly.
- B. Somatic embryos that subculture every 2 weeks.
- C. Somatic embryos that subculture every 3 weeks.



**Fig. 3:** Accumulation of biomass and intracellular and extracellular of phenolic content in the 5th week of the suspension culture that treated by 3-subcultures weekly with AC followed by subculture for 2weeks without AC and before subculture for 3weeks without AC.

## Tables

**Table 1:** Effect of activated charcoal on biomass accumulation, intracellular phenolics content and peroxidase activities in the somatic embryo of cell suspension cultures

| Elicitor               | Biomass accumulation per 0.5 g callus (g) | Intracellular phenolics content (mg g <sup>-1</sup> FW) | Peroxidase activities UE / g FW in the biomass |
|------------------------|-------------------------------------------|---------------------------------------------------------|------------------------------------------------|
| 0.0 mg/L charcoal (AC) | 34.9±1.7bc                                | 0.48± 0.04a                                             | 86.9 ± 10.5a                                   |
| 150 mg/L charcoal (AC) | 38.6±4a                                   | 0.15 ± 0.02b                                            | 55.3±7.9b                                      |
| 200 mg/L charcoal (AC) | 36.5±2.4ab                                | 0.13±0.02bc                                             | 46.9±8.7bc                                     |
| 300 mg/L charcoal (AC) | 26.5±2.9d                                 | 0.09±0.03d                                              | 37.1±3.8cd                                     |

Values are means ± standard error of three replicates. Mean values followed by the same letters (a–d) are not significantly different at p = 0.05 level according to SNK test.

**Table 2:** Effect of activated charcoal on intensity of browning and extracellular phenolics content in the spent liquid medium of suspension cultures.

| Elicitor               | Intensity of browning in spent liquid medium | Extracellular phenolics content (mg g <sup>-1</sup> FW) |
|------------------------|----------------------------------------------|---------------------------------------------------------|
| 0.0 mg/L charcoal (AC) | +++                                          | 1.4±0.25a                                               |
| 150 mg/L charcoal (AC) | -                                            | 0.27±0.04b                                              |
| 200 mg/L charcoal (AC) | --                                           | 0.23±0.05bc                                             |
| 300 mg/L charcoal (AC) | --                                           | 0.15±0.02d                                              |

Values are means ± standard error of three replicates. Mean values followed by the same letters (a–d) are not significantly different at p = 0.05 level according to SNK test.

**Table 3:** Effect of subcultures number on biomass accumulation, intracellular phenolics content and peroxidase activities in the somatic embryo of cell suspension cultures

| Elicitor                 | Biomass accumulation per 0.5 g callus (g) | Intracellular phenolics content (mg g <sup>-1</sup> FW) | Peroxidase activities UE / g FW in the biomass |
|--------------------------|-------------------------------------------|---------------------------------------------------------|------------------------------------------------|
| Subculture every weekly  | 36.8±5.3a                                 | 0.15 ± 0.02c                                            | 41.6±2.9c                                      |
| Subculture every 2 weeks | 21.6±4.1b                                 | 0.29 ± 0.025b                                           | 62.8±5.3b                                      |
| Subculture every 3 weeks | 13.5±3.1c                                 | 0.72±0.05a                                              | 83.3±4.6a                                      |

Values are means ± standard error of three replicates. Mean values followed by the same letters (a–c) are not significantly different at p = 0.05 level according to SNK test.

**Table 4:** Effect of subcultures number on intensity of browning and extracellular phenolics content in the spent liquid medium of suspension cultures.

| Elicitor                 | Intensity of browning in spent liquid medium | Extracellular phenolics content (mg g <sup>-1</sup> FW) in spent liquid medium |
|--------------------------|----------------------------------------------|--------------------------------------------------------------------------------|
| Subculture every weekly  | -                                            | 0.21 ± 0.03c                                                                   |
| Subculture every 2 weeks | ++                                           | 0.47 ± 0.03b                                                                   |
| Subculture every 3 weeks | +++                                          | 1.26± 0.2a                                                                     |

Values are means ± standard error of three replicates. Mean values followed by the same letters (a–c) are not significantly different at p = 0.05 level according to SNK test.

**Table 5:** Effect of the combining of subcultures number with and without charcoal on accumulation of biomass and phenols in the suspension cultures.

| Elicitor                                                                                               | Biomass accumulation per 0.5 g callus (g) | Intracellular phenolics content (mg g <sup>-1</sup> FW) | Extracellular phenolics content (mg g <sup>-1</sup> FW) |
|--------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|
| Subcultures weekly with AC                                                                             | 37.6±3.5a                                 | 0.14 ± 0.02c                                            | 0.21 ± 0.06c                                            |
| 3-Subcultures weekly with AC + 2-Subcultures weekly without AC + 1-subculture for 3weeks without AC    | 35.3±3.3ab                                | 0.67±0.05b                                              | 1.6 ± 0.15b                                             |
| 3-subcultures weekly with AC + 1-subculture for 2weeks without AC + 1-subculture for 3weeks without AC | 33.7±3.8bc                                | 0.96 ± 0.04a                                            | 1.86±0.3a                                               |

Values are means ± standard error of three replicates. Mean values followed by the same letters (a–c) are not significantly different at p = 0.05 level according to SNK test.