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**Assessment of Potential Cytotoxicity of Selected Henna Based Commercial Hair Dyes Using
*Allium cepa***

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Henna is a dye mainly prepared from the plant, *Lawsonia inermis*. Henna based hair dyes are considered as less toxic in comparison to artificial hair dyes. However, scientific evidenceregarding the toxicity of hair dyes is meager. The present study was conducted to assess potential cytotoxicity of three selected henna based commercial hair dyes ("Black henna" Dye 1, Dye 2 and Dye 3) using the established toxicity test model, *Allium cepa* (common onion). Pre-germinated *A. cepa* bulbs were exposed to a range of dye concentrations (0.01, 0.05, 0.1, 0.3, 0.5 and 1.0 g/L) and mineral water (control) for 48 hours (n=10 bulbs per concentration) following standard protocols and transferred to the dye free mineral water for 72 hours for recovery. Cytotoxicity was assessed using multiple end points, viz., root growth, mitotic index, mitotic phase index, and nuclear abnormality occurrence in the root meristem of the dye exposed groups compared to the controls. The results revealed that the *A. cepa* bulbs exposed to the hair dyes showed significant root growth retardation, mitosis suppression and alterations in mitotic phase indices compared with the control ($p < 0.05$), in a concentration dependent manner, indicating cytotoxicity. Occurrence of condensed nuclei in the dye exposed *A. cepa* root cells was the highest nuclear abnormality (>90%) found in both 48 hour exposure and 72 hour post exposure stages indicating the onset of the cell death process. Based on toxicity threshold values for different end points, three dyes can be ranked in the order of decreasing cytotoxicity as Dye 1 > Dye 2 = Dye 3 (root growth inhibition) or Dye 2 > Dye 1 = Dye 3 (mitosis suppression) and Dye 3 > Dye 2 > Dye 1 (total nuclear abnormality induction). As the three tested hair dyes induced cytotoxic effects on the standard test model, *A. cepa* further toxicity assessments are warranted considering human and ecosystem health.

Keywords: *Allium cepa*, bioassay, cytotoxicity, Henna hair dyes

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