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Topping Industrial Hemp (Cannabis sativa L.) to Facilitate Mechanical seed Harvest in Short Supply Chain Systems

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Italian production of industrial hemp seed for human and animal consumption is predominantly managed within short supply chain systems. The limited cultivated areas preclude the economic investments required to purchase dedicated harvesting machinery. The characteristically tall stature and high intra-canopy height variability of industrial hemp pose significant challenges to mechanical seed harvesting using conventional farm equipment, including modified combine harvesters employed for other crops. The present study investigates the potential of topping (apical shoot removal) as a cultural practice to facilitate hemp seed harvesting with non-specialized machinery. Topping is known in other contexts (sugar beet for seed production), but its systematic application to seed hemp for mechanical harvesting purposes is little explored in the literature. This practice aims to reduce overall plant height and improve canopy height uniformity. Such morphological modifications are expected to enhance the operational performance of standard harvesting equipment by reducing the volume of fibrous biomass that machines must process in their threshing and separation systems. A field trial was conducted in 2023 at the experimental farm of CREA-CI (Rovigo, Italy), comparing topped versus non-topped plants of two monoecious hemp varieties bred for seed production: Codimono - a CREA-CI variety - and Futura 75 - a commercial reference variety widely adopted in the Italian market. Parameters assessed at harvest included canopy height uniformity, and seed yield. Topping, performed approximately 50 days after sowing, significantly reduced and uniformized plant height at harvest. Furthermore, secondary stems developing after apical removal exhibited markedly smaller diameters, thereby reducing mechanical impedance during biomass transit through the harvester. Seed yield responses to topping, however, differed between the two varieties, highlighting a genotype X management interaction that leads to further investigations across multiple growing seasons. These results open up to other interesting investigations, for example which varietal characteristics predict a positive response and highlight how this technique could encourage sustainable crop diversification by reducing burdens for small farmers who want to include hemp in their crop rotation.