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Securing wild edible plants for planetary healthy diet

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Meeting the food and nutritional demands of a growing population is a major sustainability challenge for humanity in the 21st century (Dubey et al., 2021a). The Food and Agricultural Organization (FAO) of the United Nations' latest edition of the "State of Food Security and Nutrition in the World" report revealed a stark reality that about 2.3 billion people suffered from moderate or severe food insecurity in 2021 (www.fao.org). Despite a significant increase in food production worldwide, various ecological, environmental, and socio-economic changes such as ecosystem degradation, biodiversity loss, climate change, pollution, conflicts, political invasions, pandemics such as COVID-19, and the rising cost of living have negatively impacted global food and nutrition security (www.fao.org). Moreover, the EAT Lancet Commission Forum (<https://eatforum.org/eat-lancet-commission/>) uncovered the alarming reality that the current human diet worldwide is imbalanced and detrimental to the planet. Urgent action is required to shift towards a planetary healthy diet for the wellbeing of people and the planet. The Commission suggested using 50% more plant-based commodities, including wild plants of various categories such as red, green, and orange wild leafy vegetables, wild fruits, nuts, and berries, to convert the human diet into a healthier, balanced, and planet-friendly one.

Dietary diversification is crucial in averting malnutrition, and using wild and neglected plants that possess nutritionally and agriculturally important traits is a cost-effective, safer, and nature-based solution for crop diversification and agroecological stability (Singh et al., 2020). In this context, this commentary outlines the potential and benefits of exploiting wild plants for multiple purposes.

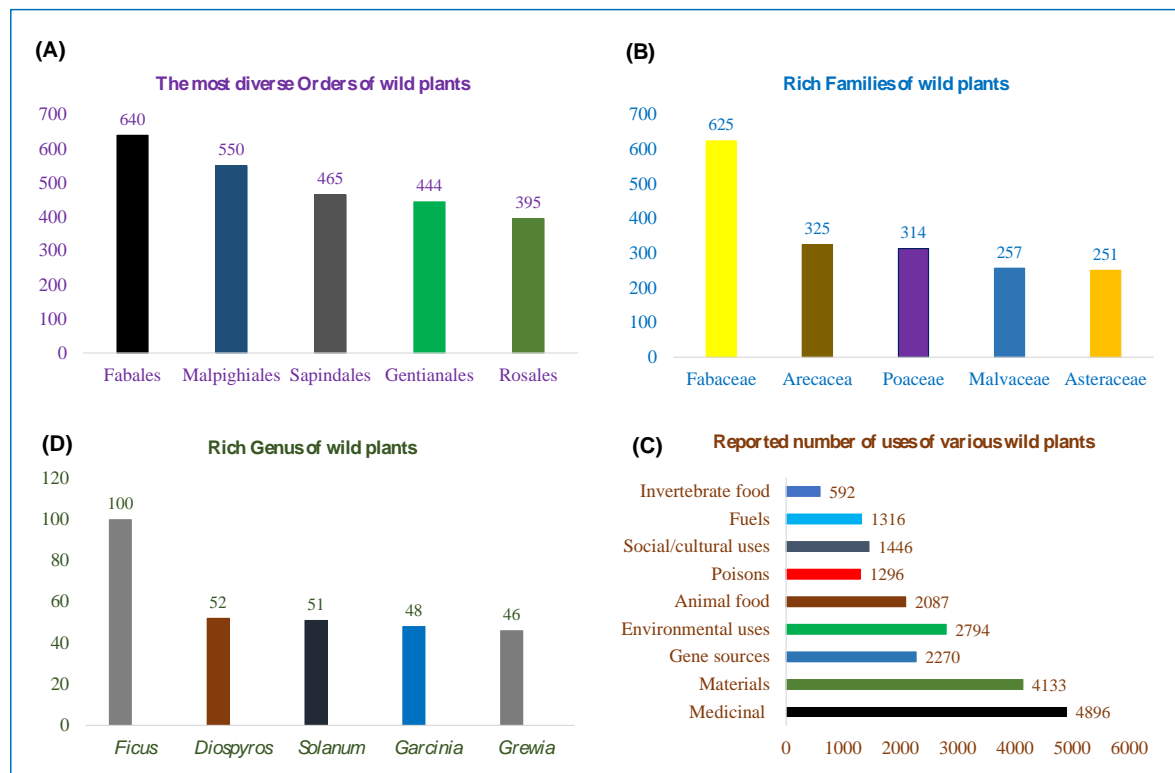
Although prehistoric humans foraged on a wide variety of wild plants (Borelli et al., 2020), the Neolithic revolution led to the domestication of wild plants as crops (Schwanitz, 1966). Modern agricultural practices have further resulted in the large-scale selection and domestication of a few crops, with approximately 10 to 50 plant species being responsible for 95% of the world's caloric intake. Reports suggest that pre-agricultural human societies used at least 7,039 edible plant species (including 7,014 vascular plants), representing 2% of the total catalogued angiosperm species diversity, for multipurpose uses, including food and nutrition (Meyer et al., 2012; FAO, 2015; Diazgranados et al., 2020; Ulian et al., 2020). However, over half of these nutritional treasure troves are yet to be unlocked for their nutritional and agroecological benefits. Therefore, the term "wild edible plant" describes species that grow naturally without human assistance, mainly outside cultivated areas, in field margins, forests, woodlands, grasslands, and wetlands.

Given that agroecosystems cover about 38% of the global land area and are responsible for 34% of global greenhouse gas emissions, 70% of global freshwater usage, and the largest non-point sources of pollution, it is imperative that we adopt clean, green, and sustainable production practices to keep food production within planetary boundaries (Crippa et al. 2021; Dubey et al. 2021a). Additionally, since agricultural systems often act as transitional zones between urban, rural, and wild/protected areas, maintaining species diversity in agroecosystems is crucial, especially the diversity of pollinators and other critical organisms, to ensure the health and diversity of nearby ecosystems (Dubey et al. 2021b). However, modern agriculture, which relies on high-input resources and monocropping, has led to a reduction in agrobiodiversity in various agroecological regions of the world. The widespread cultivation of staple foods such as maize, rice, wheat, potato, cassava, soybeans, sweet potatoes, yam, sorghum, and plantain has limited options for crop diversification (Singh et al., 2020). On the other hand, exploring the agricultural and nutritional potential of untapped wild plant species provides numerous options for crop diversification and subsequent dietary diversification. Therefore, the adoption of sustainable agricultural practices based on crop diversification and multiple cropping systems, primarily with the help of wild and neglected plants, will increase species diversity and agroecosystem resilience (Dubey et al., 2021b). As wild plants possess better adaptation traits and climate resilience than modern crop varieties, their sustainable utilization would be advantageous for directly or indirectly achieving various SDGs, such as no poverty (SDG:1), zero hunger (SDG:2), good health and wellbeing (SDG-3), responsible consumption and production (SDG:12), climate action (SDG-13), and life on land (SDG-14) (Singh et al., 2020). Furthermore, it would help meet the targets of other international commitments such as the Bonn Challenge (www.bonnchallenge.org), UN-Decade of Ecosystem Restoration (www.decadeonrestoration.org), and the UN Post-2020 Global Biodiversity Framework (www.undp.org).

Though neglected species possess several promising traits for large-scale exploitation (e.g., food and nutritional, medicinal, environmental, biocultural, and religious importance), refining their promising traits through suitable crop improvement/breeding programs is essential for unlocking their true potential (Garnatje et al., 2017; Singh et al., 2020; Borelli et al., 2020). As suggested earlier, a worldwide exploration and cataloguing of edible species must be conducted to identify the most promising species for dietary diversification and sustainable agriculture, and gene banks of promising species must be established for future use. International agencies like FAO and research organizations under the aegis of FAO can take the lead in this regard (Singh et al., 2020). Additionally, the validation of suitable agronomic packages is imperative for large-scale cultivation and intercropping with modern crop varieties, and this can be done with the assistance of all global/regional/national institutions involved in crop improvement programs. Since wild plants belong to different categories (such as wild leafy vegetables, legumes, flowers, seeds, tubers, fruits, berries, nuts, etc.) and life forms (herbs, shrubs, and trees), they require a customized package of practices for cultivating together with their modern counterparts. Furthermore, the traditional ecological knowledge, culinary preparation skills, as well as the biocultural knowledge of local/native people, can be utilized for the sustainable utilization of wild plants. Local authorities (village, municipal authorities) can take necessary measures to enlist and catalog all potential wild species with food and nutritional relevance in their localities, and wild-species based community kitchen/neighbourhood gardens can be created for popularizing and conserving these species at the village/local level. Food carnivals, especially based on wild edibles, are also essential for showcasing the edible, nutritional, culinary, and cultural values of such species. Since wild species are hardy and resistant to pests and diseases, they can be grown even in nutrient-poor soils. Suitable agroforestry models, especially based on wild edible trees, can be developed for restoring marginal and degraded lands and thereby converting such unproductive land to community nutri-gardens or food gardens.

Promising wild plant species can be grown in schools and college campuses of developing countries to provide nutritious options for mid-day meal programs. Let's develop robust plans to reintroduce wild edibles to the table for the wellbeing of both people and the planet.

Figure 1: (A-D) shows the wild plants in numbers such as the most diverse Orders, Families, reported number of additional uses (apart from as food) and rich Genera (clock-wise) (FAO 2015; Diazgranados *et al.* 2020; Ulian *et al.* 2020)



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