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Buckwheat- A Versatile Yet Underutilized Crop

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SUMMARY

Buckwheat is an underutilized crop, which is high in nutritional and nutraceutical values with phenomenal adaptability under diverse environmental conditions, especially in moisture stress and poor and marginal soil conditions. Besides, its use as food and feed, it can render multiple roles including cover crop, nurse crop, green manure crop, smother crop, pollinator crop and emergency crop. Despite its tremendous potentials, it has been neglected by scientific community and policy makers, and an immediate focus and concerted efforts in the form of research activities and policies are mandatory to further improve this crop and promote it among common masses for addressing food and nutritional insecurity.

INTRODUCTION

At present, global food production is at critical stage, as it mainly relies on few major crops for meeting the food and nutritional requirements of the ever-increasing population, side-lining the otherwise nutrient dense and versatile crop species, popularly known as orphan or underutilized crops. Out of more than 10,000 edible species, only 150 species have been globally commercialized and three crops- wheat, rice and maize contributes about 51% of the world's caloric intake (Khoury *et al*., 2014). Intensive cropping of few selected crops has immense environmental consequences, including loss of crop species. Besides this, rapid rise in chronic diseases like cardiovascular diseases, cancer and deficiency diseases have been widely reported worldwide mostly attributing to malnutrition or unbalanced diet, particularly in developing and under-developed nations (Baldermann *et al*., 2016). These have stimulated the scientific community of the globe to explore and research regarding production and utilization of various underutilized, underexploited and new alternative crop species. Buckwheat is one of the underutilized crops, which have been domesticated since ancient times in South China (Gondola and Papp, 2010). Globally, Russia is the largest producer of buckwheat followed by China and Ukraine, respectively (FAOSTAT, 2020). It has been grouped under the category called "pseudocereals" as its edible seeds are starchy in nature and is consumed as cereal grains but the plant does not grow like grasses. Buckwheat has phenomenal adaptability that allows the plant to grow in almost all kinds of extreme environments, particularly in moisture stress and poor and marginal soil conditions (Li and Zhang, 2001). This crop belongs to the family *Polygonaceae* and genus *Fagopyrum*. The genus *Fagopyrum* consists of over 24 species (Chen, 2012), out of which two species i.e; Common Buckwheat (*F. esculentum*) and Tartary Buckwheat (*F. tataricum*) are widely cultivated. The seed of this crop resembles tetrahedron in shape and consists of a thick hull and an inner, edible kernel. Common Buckwheat is an annual species with a hollow stem of green to red colour variation and grow up to a height of about 2-5 feet. Tartary Buckwheat is another annual herb which is more frost-tolerant than Common Buckwheat. Morphologically, it is smaller and slenderer and its seed is approximately 40% smaller than that of Common Buckwheat (Ernest, 2017).

Buckwheat- A Versatile Multifarious Crop

Buckwheat is a versatile crop which is well known for its multifarious utilities. Broadly, its uses can be categorized into three groups:

I. Food and Feed:

For human consumption, hulled grain of buckwheat is generally used to prepare a diverse forms of food products, including breads, biscuits, breakfast cereals, noodles, porridges, soups, stews and alcoholic beverages. The grain of buckwheat is gluten free, rich in essential amino acids, minerals, resistant starch and high in albumin

protein thus making it fit for consumption for persons suffering from diabetes and other diseases (Chen *et al*., 2018). It is also cultivated to obtain feed, forage and fodder for livestock, piggery and poultry (Babu *et al*., 2018).

II. Nutraceutical Properties:

Buckwheat is storehouse of bioactive compounds such as antioxidants (mainly rutin, quercetin and hyperin), phytosterols, dietary fibres, minerals, resistant proteins and starches that have been reported to exert health benefits including anti-carcinogenic, anti-diabetic and positive cardiovascular effects (Ahmed *et al*., 2014).

III. Bio-Diversity Values:

Buckwheat can play multiple roles namely cover crop (protects soil from erosion and maintaining its quality) (Babu *et al*., 2018), nutrient scavenger crop (efficient absorber of minerals particularly phosphorus and calcium from deeper soil layer, which will be released to other plants after decomposition) (Das *et al*., 2015), guard crop (protects main crop from wild or strayed animals) (Babu *et al*., 2018), nurse crop (assists slower-growing but longer-lived crops), break crop (disrupts the life cycle of pests and diseases), green manure crop (produces high bio-mass within short period that can be incorporated into soil for its improvement and rehabilitation) (Ernest, 2017), smother crop (suppresses weeds through shade and allelopathy) (Wirth and Gfeller, 2016), natural pest controller crop (attracts beneficial insects that control unwanted pests) (Frank and Liburd, 2005), emergency crop (can be used as substitute for failed crop under aberrant weather and ensures certain monetary return) (Thorup-Kristensen *et al*., 2003), pollinator crop (assists in production of high quality honey) (Mizutani *et al*., 2010) and organic crop (requires inputs like synthetic fertilizers, herbicides and pesticides in minimal quantity thus making it appealing and suitable for cultivation under organic farming) (Chamberlain *et al*., 2010).

Future Prospects

From the above discussion, it is apparent that buckwheat is a versatile yet underutilized crop that can render several benefits like food, nutritional, nutraceutical and bio-diversity values. Owing to its hardy nature, it can be grown in adverse environmental conditions and displays an enormous potential to acts as climate resilient crop. Owing to its short duration nature it can easily fit into crop diversification and intensification programmes. Also, it can be grown in rainfed cropping systems as contingency crop under aberrant weather situation. Buckwheat is a kind of superfood as its grain is a high in essential amino acids, dietary starch, proteins, vitamins and micro nutrients. Due to this, it can serve a high-quality nutrition supplements especially for small and marginal farmers. Also, buckwheat contains good quality bioactive compounds like rutin and fagopyrin, which has been used for treatments of various health ailments.

Despite all these, buckwheat is not popularly grown in large scale. One of the main reasons is that the crop produces less grain in good agricultural soils and climates, unlike major cereal crops. It gives better performance under poor soils and short-season cool climates, like hilly regions (Ernest, 2017). Also, buckwheat has not been significantly improved through various breeding programmes, like in case of major cereals. So, in order to alleviate this crop in better position, there is an urgent need to draw the attention of scientific community and policy makers is required for developing and advocating location specific scientific interventions and policies.

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