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Pseudocereal Buckwheat With Potential Anticancer Activity

Shaon Kumar Das*[1], RK Avasthe[2], Goutam Kumar Ghosh[3] and Sudip Kr. Dutta[4]

Author's Affiliation
[1,2,4]ICAR Research Complex for NEH Region, Sikkim Centre, Tadong, Gangtok, Sikkim-737102
[3]Palli Siksha Bhavana, Visva Bharati, Shantiniketan, West Bengal

***Corresponding Author:**
Shaon Kumar Das,
Scientist, Senior Scale (Agril. Chemistry/Soil Science)
ICAR-National Organic Farming Research Institute
(*formerly ICAR RC for NEH Region, Sikkim Centre*)
Tadong, Gangtok, Sikkim-737102

E-mail:
shaon.iari@gmail.com

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Abstract

Among the minor cereals buckwheat is an important crop in feeding the mankind and animals to meet the ever increasing demand of rapidly expanding population of North East India. It is an important crop of the mountain regions at elevations above 1400 m amsl for grain and green leaves. In the higher Himalayas, up to 4500 m, this is the only crop which can be grown successfully. The harvesting period is not limited in Tartary (Tithey) buckwheat (*Fagopyrum tataricum*) as compared to common (Mithey) buckwheat (*Fagopyrum esculentum*). The 'Mithey' type matures earlier than 'Tithey' type.

Buckwheat is a pseudocereal/minor food, has a short duration, a nutritional crop; but it is one of the major staple food crops of the Indian Himalayan people. There are two species of buckwheat cultivated in the Indian Himalaya *(Fagopyrum esculentum* and *Fagopyrum tataricum)*. Buckwheat has been found to have antioxidant, anticarcinogenic, antimutagenic, and antifungal properties. It is able to recover in the cells of a malignant tumor oppressed p gene; the gene inhibits the growth of cancer cells and kills them[1]. It contributes to controlling blood sugar which has been shown to lower risk of diabetes, cancer and heart disease. Buckwheat is cultivated primarily to obtain grains for human consumption. It is known to contain various antioxidative compounds such as vitamins B, vitamin E and phenolics such as rutin, quercetin, and 1,2 proanthocyanidines (condensed tannins). Rutin in buckwheat is listed among the most important characteristics from the viewpoint of nutrition. The plant contains antioxidants rutin (~10–200 ppm) and tannin (~0.1–2%). The phenolics has desirable physiological and biological properties, such as anti-hypertension, vasoconstrictive, spasmolitic and a positive inotropic effect, provides protection against gastric lesions, protects against UV light, lowers plasma cholesterol, protects from oxidative stress, causes muscle hypertrophy and also suppresses gallstone formation and cholesterol level[2]. Significant variations in rutin and quercetin content were reported within buckwheat grain and it depends on the species, varieties, development phase, genotype, growing conditions, plant part and weather. Flavonoid content in *F. tartaricum* is generally higher than that in *F. esculentum*. In *F. tataricum seeds*, the flavonoid content is ~40 c. mg/g, while that of *F. esculentum* seeds is ~10 c. mg/g. In *F. tataricum* flowers, leaves and stems, the flavonoid content can exceed 100 mg/g depending on germplasm. The amount of rutin in *F. tartaricum* can reach values

up to 200 times higher than that of *F. esculentum*. In experimental animals, they are known to suppress gallstone formation more effectively than soy protein isolate. They are also associated with retardation of mammary carcinogenesis by lowering serum estradiol, and with suppression of colon carcinogenesis by reducing cell proliferation. The main bioactive components responsible for these effects are believed to be phenolics like rutin and quercetin. It has been found that whole buckwheat contains 2-5 times more phenolic compounds than oats or barley, while buckwheat bran and hulls have 2-7 times higher antioxidant activity than barley, triticale and oats. Buckwheat contains a majority of phenolic compounds present in the free form and distributed throughout the entire grain[3]. In recent years, rutin and quercetin have attracted increasing interest because they have various beneficial health effects. Rutin is widely present in plants, but is relatively rare in their edible parts. No rutin has been found in cereals or pseudocereal except buckwheat. Most rutin is accumulated in the inflorescence (up to 0·12 mg/g DW), in stalks (0·004–0·01 mg/g DW), upper leaves (0·08–0·10 mg/g DW) and 0·12–0·36 mg/g DW in grains. The highest quantity of rutin is found in leaves immediately before flowering; therefore providing the opportunity for utilizing buckwheat tops for the natural fortification of food with rutin. Quercetin (quercetin-3-rhamnoside), a natural flavonoid shows significant inhibition effects on malignant cells growth in leukemia, breast, hepatic, ovarian, colorectal, gastric, and endometrial cancers[4]. It is a glycoside present in buckwheat at concentrations ranging from 0.01 – 0.05% d.m. in tartary buckwheat, and from 0.54 – 1.80% d.m. in common buckwheat. Several studies have shown that quercetin control cancer cell growth through the regulation of specific signaling pathways, such as decreasing oncogene expression, inducing malignant cells apoptosis and inhibiting angiogenesis *etc*. It can significantly inhibit the proliferation of $HepG_2$ cells and induce apoptosis, possibly through the participation of cyclin D_1 regulation[5]. Buckwheat is multiple useful crop plant with medicinal value and all its parts (roots, stem, leaves, flower, fruits, and flour) are used to care various alignments (diseases) locally in traditional healthcare system[6]. The crop will help to the pharmaceutical industry regarding phytochemicals rutin and quercetin. Keeping in view of the nutritional quality of the crop for marginal and degraded lands, there is a need to rethink about its cultivation in Himalayan Region of India.

REFERENCES

[1]. Das, S.K, Avasthe, R.K. and Singh, M., *Curr. Sci.,* 2015, 109(10), 1763.
[2]. Kiprovski, B., Mikulic-Petkovsek, M., Slatnar, A., Veberic, R., Stampar, F., Malencic, D. and Latkovic, D., *Food Chem.,* 2015, 185:41-47.
[3]. Lee, C., Lee, B. H. and Lai, Y. J., *J. Food Sci. Techno.,* 2015, 52:1110-1116.
[4]. Bai, C. Z., Feng, M. L., Hao, X. L., Zhong, Q. M., Tong, L. G. and Wang, Z. H. *Genet. Mol. Res.,* 14(4):19040-19048.
[5]. Ravishankar, D., Watson, K. A., Boateng, S. Y., Green, R. J., Greco, F. and Osborn, H. M., *Eur. J. Med. Chem.,* 2015, 5:259-274.
[6]. Wronkowska. M. and Haros, M. *J. Cereal Sci.,* 2014, 60:477-483.