Compared with common buckwheat (*Fagopyrum esculentum*), Tartary buckwheat generally contains much higher levels of rutin and other flavonoids. Because of this difference, Tartary buckwheat has attracted greater attention in studies related to metabolic syndrome, diabetes, and cardiovascular diseases. However, most current evidence still comes from cell experiments, animal studies, and functional food evaluations. More long-term human intervention studies are still needed before these effects can be translated into clinical nutritional recommendations.

6.3 Anticancer and antimicrobial properties

As an underutilized crop, Tartary buckwheat has attracted increasing attention because of its potential anticancer properties. Its anticancer effects are believed to result from a complex phytochemical system rather than from one single therapeutic compound (Hassan and Ganai, 2025). Rutin, quercetin, phenolic acids, polysaccharides, and buckwheat-derived bioactive peptides may contribute to anticancer activity through antioxidant effects, anti-inflammatory responses, induction of tumor cell apoptosis, and inhibition of abnormal cell proliferation.

Tartary buckwheat is usually considered more valuable than common buckwheat in anticancer-related research because its flavonoid content is generally much higher. This makes it an important candidate for the screening of functional anticancer compounds and the development of health-oriented foods. Nevertheless, current evidence remains largely limited to in vitro experiments and animal models. At present, Tartary buckwheat should be regarded mainly as a source of preventive functional foods and natural bioactive compounds rather than as a direct substitute for clinical anticancer drugs.

In addition to anticancer activity, Tartary buckwheat also shows certain antimicrobial potential. Some studies have reported that buckwheat phenolics and peptides can inhibit the growth of several bacterial strains and may interfere with microbial metabolism or membrane integrity. However, antimicrobial activity is strongly influenced by extraction methods, processing conditions, and compound concentration. Therefore, more standardized studies are needed before buckwheat-derived antimicrobial compounds can be widely applied in medicine or food preservation systems.

6.4 Anti-obesity and metabolic regulation functions

Obesity is usually associated with lipid metabolism disorders, chronic low-grade inflammation, insulin resistance, and gut microbiota imbalance. Because these metabolic disturbances involve multiple physiological pathways, single compounds often have limited effects. The advantage of buckwheat lies in its multi-target component system. Dietary fiber can influence satiety and intestinal fermentation, proteins and peptides may regulate lipid metabolism, flavonoids and polyphenols can reduce oxidative stress and inflammation, and some compounds may further affect bile acid metabolism through interactions with gut microbiota.

Bae and Kim (2022) did not only measure flavonoids or antioxidant compounds in germinated buckwheat materials. Instead, they used an in vitro gastrointestinal digestion model to investigate the antioxidant and anti-obesity activities of digested products obtained after simulated digestion. This approach better reflects the physiological state after human consumption. The digested products of germinated buckwheat still maintained strong free radical scavenging activity and reducing power. In lipid metabolism-related experiments, they also showed the potential to inhibit lipid accumulation and alleviate obesity-related oxidative stress.

The germination process may activate endogenous enzyme systems in buckwheat grains and promote the release of bound phenolics and flavonoids, thereby improving the bioaccessibility of small active molecules. Therefore, the anti-obesity effects of buckwheat are not simply determined by its original nutritional composition. They are closely associated with the continuous process of germination, gastrointestinal digestion, release of active compounds, and regulation of lipid metabolism.

7 Buckwheat Landscape Utilization and Eco-Tourism

7.1 Flowering buckwheat landscapes and rural aesthetics

During the flowering period, large areas of buckwheat fields form white, pink, or light purple landscapes with strong visual appeal and obvious seasonal characteristics. The attraction of buckwheat landscapes is not only