Some unique wild species of the Polygonaceae (Buckwheat family) have been widely used in Mongolian folk medicines for treating various infections, inflammations, etc. However, their complicated and multiple pharmacological effects were not understood until recently. These herbs are rich in flavonoids and this polyphenolic compounds can present the main biological function for Polygonaceae species. The purpose of this study was to characterize the beneficial antioxidant phytonutrients present in these medicinal species and the mechanisms responsible for their physiologic functional effects.

The antioxidant capacity (AOC), total phenolic (TP), and total quercetin (TQ) content of 11 plants from Polygonaceae were evaluated. These plant extracts showed high AOCs and high TP contents. AOCs were positively correlated with TP contents. Moderate correlations were observed between AOCs and TQ contents. These results suggest that quercetin glycosides may be one of the important contributors to AOC of Mongolian Polygonaceae plants. In addition, TP content and AOC of all Polygonaceae plants were higher at the end of full flowering, and decreased as they matured depending on their species during vegetative period. The AOC and the contents of TP and TQ of P. sibiricum, R. gmelinii, P. angustifolium, and P. divaricatum were higher than those of other Polygonaceae species. They might be a good source of antioxidants that can be used in foods and nutritional supplement formulation.

The effects of various Polygonaceae on mast cell-mediated allergic reaction and the activity of anti-α-glucosidase activities were evaluated. The plants, P. sibiricum, P. divaricatum, P. angustifolium, R. acetosella, R. gmelinii, and P. alopecuroides were found to be the potent inhibitors of anti-α-glucosidase and F. tataticum, P. sibiricum, R. gmelinii, R. acetosella, P. angustifolium and P. divaricatum strongly decreased the antigen-induced degranulation in RBL-2H3 mast cells. Total quercetin contents were positively correlated with the anti-α-glucosidase and anti-β-hexosaminidase-releasing activities. Therefore, these Polygonaceae species may be used clinically to treat various allergic diseases and diabetes mellitus.

The affections of some phenolic compounds, which are existence in
Polygonaceae plants, on hepatic fatty acid synthesis in mice were investigated. Male ICR mice were fed an experimental diet containing 10 g/kg quercetin dihydrate, rutin, or ferulic acid or a control diet free of phenolic compounds for 15 days. Quercetin significantly lowered serum cholesterol and phospholipid levels in mice. Also, the serum triacylglycerol level was considerably lower in mice fed the quercetin diet than in those fed a diet free of phenolic compounds though the difference was not significant. Rutin and ferulic acid did not affect these parameters. Quercetin significantly reduced the activity and mRNA levels of various enzymes involved in hepatic fatty acid synthesis. Rutin reduced a few of the parameters for lipogenesis, but ferulic acid did not affect any of the parameters. It was suggested that a reduction in hepatic lipogenesis is the mechanism underlying the hypolipidemic effect of quercetin.

The impact of quercetin on the mRNA expression of hepatic enzymes involved in drug metabolism was evaluated with a DNA microarray and real-time PCR. Male Sprague–Dawley rats were fed an experimental diet containing either 0, 2.5, 5, 10, or 20 g/kg of quercetin for 15 days. Dietary quercetin increased the mRNA expression of glutathione transferase (Gst) and aldo-keto reductase (Akr) involved in drug metabolism in an isoenzyme-specific manner. Quercetin dose-dependently increased the mRNA expression of Gsta3, Gstp1, and Gstt3 among the Gst isoenzymes. Some moderate increases also occurred for Gstm isoenzymes. However, quercetin was totally ineffective on the other Gst isoenzymes. This flavonoid also up-regulated the mRNA expression of Akr1b8 and Akr7a3, but not that of any other Akr isoenzyme. It is apparent that quercetin increases the mRNA expression of Gst and Akr involved in drug metabolism in an isoenzyme-specific manner. Inasmuch as Gst and Akr isoenzymes up-regulated in their gene expression are involved in the prevention and attenuation of cancer development, this consequence may account for the chemopreventive propensity of quercetin.

In conclusion, these results scientifically support the view that many of the Polygonaceae plants, which are mainly consumed in traditional medicine in Mongolia, contribute to health. The health-promoting activities of Polygonaceae plants, such as anti-cancer (or chemopreventive propensity), anti-diabetic, and anti-allergic effects, may be related to their AOCs.