

**Proposals for 2014-2015**  
**Potato Postharvest Physiology**  
**San Luis Valley Research Center, Department of Horticulture & LA**

**Funding Source: CCPGA Royalties**

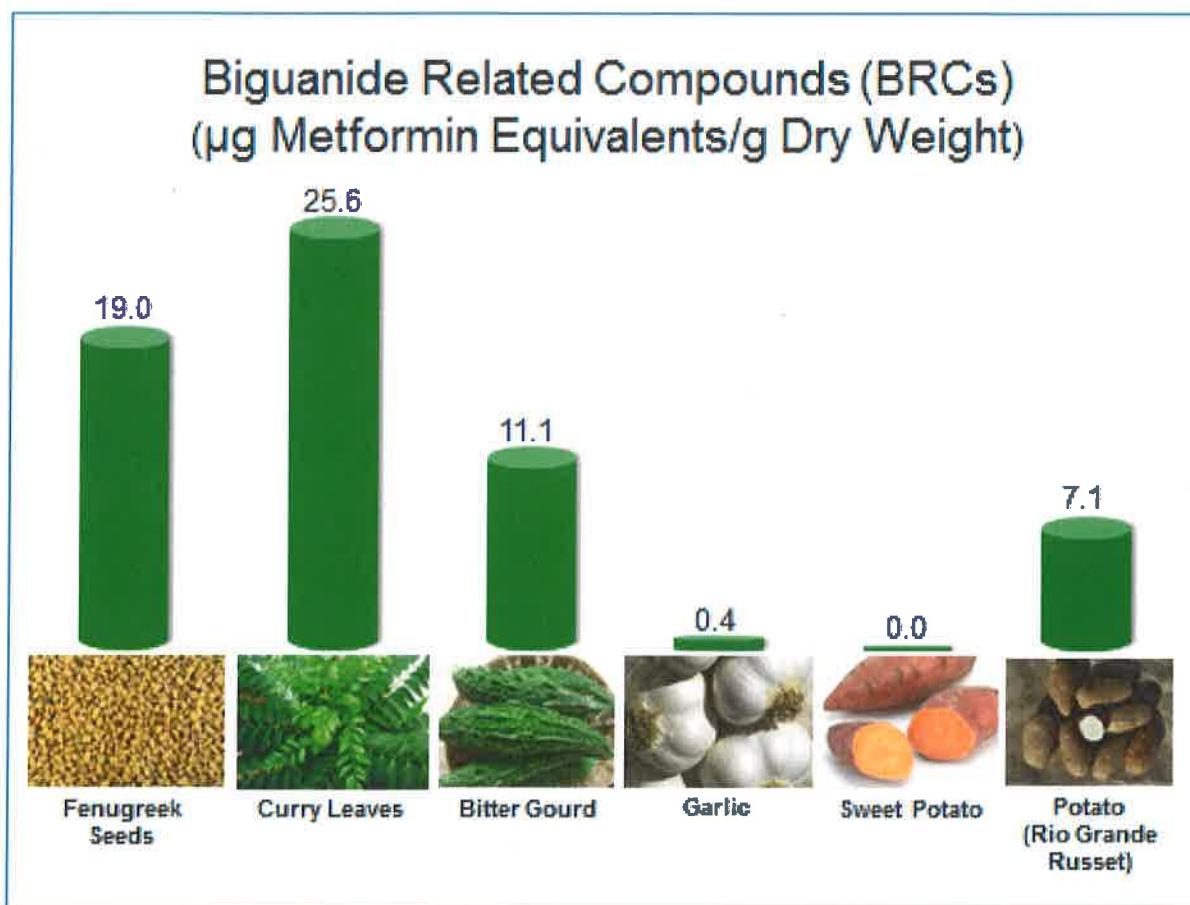
**Title:** Enhanced nutritional/human health profile: Studying biguanide and related compounds in Colorado potato cultivars

**Project Personnel:** Sastry Jayanty and Dave Holm

**Nature, scope, objectives of proposed research**

The potato is one of the most important vegetable with respect to its value of production and nutritional impact. The chemical and nutritional composition of potatoes varies among the cultivars and market classes, and can be influenced by the environmental conditions in which they are grown. The market classes of potatoes vary widely in regards to skin type and flesh color. Colored potatoes, which are called specialties, are higher in antioxidants than white potatoes (Perla et al., 2012). Dietary antioxidants are considered to reduce oxidative stress in the body, so these colored potatoes have been associated with alleviating many degenerative diseases, including cancer.

Type-2 diabetes is the most common metabolic disorder worldwide, and its prevalence is



growing at alarming rates in both developed and developing countries. Oral antidiabetic agents used to treat type-2 diabetes are commonly available on the drug market, including biguanides, sulfonylureas, thiazolidinediones, meglitinides, and  $\alpha$ -glucosidase inhibitors (Mahajan & Gupta, 2010). Among biguanides, metformin (dimethylbiguanide), also known as 'glucophage', is the most widely prescribed drug used in the treatment of diabetes. The history of metformin can be traced back to the use of French lilac (goat's rue, Spanish sanfoin, or false indigo) as an herbal medicine in medieval Europe. French lilac is rich in guanidine, a substance with blood glucose-lowering (hypoglycemic) activity that is contained in the basic structure of metformin.

Biguanides reduce hyperglycemia by increasing insulin sensitivity, decreasing glucose absorption, and inhibiting hepatic gluconeogenesis. Metformin is currently available on the drug market because of its unique mechanism of action, lower risk of lactic acidosis compared to that of phenformin, and its successful use in over 90 countries. In addition, biguanides are also used as antimalarial drugs. Furthermore, these compounds are known to have oral hypoglycemic, tumor-inhibiting, antibacterial, tuberculostatic and antiviral properties

There are about 800 plants that may possess potential anti-diabetic ingredients. Fenugreek, curry leaves, bitter melon, garlic, and sweet potato are few among the 45 plants that have shown experimental or clinical anti-diabetic activity. Although fenugreek, curry leaves, bitter melon, garlic and sweet potato are known for antihyperglycemic properties in Ayurvedic medicine for several centuries; their active components remain to be identified. The concept of synthesizing biguanides, such as metformin, originated from the hypoglycemic properties of plant guanidines. However, there has been no report of plant biguanides. The objective of this study was to identify biguanide and related compounds (BRCs) in medicinal plant foods (fenugreek, curry leaves, bitter melon, garlic, and sweet potato) and potato tubers. The presence of antidiabetic compounds, such as flavonoids and polyphenols, in potato tubers encouraged us to include them in this study. Figure 1 describes the BRCs in the plant foods before and after correcting for common interfering compounds in assays.

### **Objectives**

1. Identification and quantification of biguanide and related compounds (BRCs) in fruits and vegetables
2. Developing a rapid GC MS based method to screen biguanide compounds in Colorado potato germplasm.

### **How the project will enhance the competitiveness of Colorado potato growers:**

This research will enhance the value of our industry by increasing grower returns and open new markets

**Extension-outreach plan for reporting project information to growers**

Results will be presented and reported to grower community and scientific community using following avenues

- Rocky Mountain Ag conference,
- Northern Colorado Potato Grower meeting
- Potato Association of America Annual meetings
- Field days,
- Open house,
- Tours,
- Annual Reports
- Spuditem or newsletter.
- And site visits to commercial storages and
- Web site

**Potential for results to leverage additional outside funding**

This is one of the important research areas identified by Specialty Crop Research Initiative grant advisory panel, which includes nutritionists, dieticians, potato trade organizations, Chefs and processing, fresh market, growers and related industry.

**Funds requested- \$25,000**

Research Associate (50%):	\$16,000.00
Equipment and laboratory supplies:	\$4,000.00
Chemicals Supplies and Services:	\$5,000.00