



# Mountain State University

## FINAL REPORT

Specific Cooperative Agreement Number 58-1932-2-229

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### Summary

**Problem 1:** Numerous medicinal plant species that have significant economic value are native to West Virginia. Many of these species have been harvested excessively throughout the Appalachian region, and their sustainability, in the face of market demands, depends upon their cultivation. While wild crafting certain plants is a long-standing tradition in West Virginia, agricultural production of valuable medicinal plants is limited because of farmers' lack of knowledge of propagation and processing procedures and their minimal experience with small business creation. West Virginia farmers need to learn how to produce medicinal plants profitably, how to add value to the products by processing them, and how to organize themselves to capitalize on market opportunities. New, high-value medicinal crops that utilize the unique climatic and production attributes of Appalachia would promote agricultural diversification and enhance the economic status of the small farms that dominate the region.

**Problem 2:** Appalachian farmers are turning to meat goat production to capitalize on the increasing demand for chevon by ethnic populations in the Northeast. Meat goat production strategies for this region of the country are poorly defined. Regional plant resources not traditionally used in small ruminant production systems may have value as forage or forage supplements, but they have not been evaluated for these applications. The gastrointestinal parasite *Haemonchus contortus* (barber pole worm) is the most common and serious health problem encountered by meat goat producers. Barber pole worms attach to the abomasal (true stomach) wall where they feed on the blood of the host. Diminished animal performance and death caused by barber pole worms decrease the profitability of goat production. Barber pole worms are becoming resistant to the few anthelmintic drugs labeled for use in goats. Traditional medicine recognizes the anthelmintic properties of several plant species, some of which may be effective for reducing parasite infestations in goats. Plant materials with anthelmintic activity against barber pole worms could decrease the frequency of anthelmintic drug administration and help maintain the effectiveness of these drugs. Dietary plant resources can also improve the quality and shelf life of meat products derived from small ruminants.

**Objectives:** The overall objectives were to identify non-traditional plant species that can be used as forage or feed supplements for finishing meat goats, to control gastrointestinal parasites in small ruminants, or to produce meat with nutritional and health benefits for humans; to develop propagation and cultivation techniques and marketing strategies for Appalachian medicinal plants; and to transfer technologies to growers, entrepreneurs, and students.

**Approach:** MSU Medicinal Botanicals Program (MBP) staff collaborated with AFSRC scientists to identify plant materials having medicinal value for small ruminant livestock. Investigations

specifically addressed production of herbs that might control gastrointestinal parasites or otherwise enhance animal performance. The research defined relationships between plant growth conditions and concentrations of bioactive constituents of plant resources. The MBP led educational, processing, marketing, and technology transfer activities. Community- and farmer-education efforts involved development of greenhouse exhibits, a demonstration garden, walking trails, and woodland plots supported by plant rescues from areas targeted for construction, mining, and timbering activities. Outreach activities included publication of a newsletter and conference proceedings, maintenance of a dynamic Program web site, and organization of symposia, seminars, workshops, and field days for partners, customers, and stakeholders.

### **Most significant accomplishment since July 15, 2002**

Research: In the fall of 2005, personnel of the MSU Medicinal Botanicals Program and the AFSRC redirected the focus of the Medicinal Botanicals Program from education to research in support of CRIS 1932-63000-001-00D, the objective of which is to design forage-based finishing systems capable of producing 80-pound meat goats with carcasses having a high lean-to-fat ratio and meat with consumer benefits. To this end, a research project plan was developed and initiated to identify and investigate plant materials that have potential value in meeting meat goat health and performance, carcass, and meat quality objectives. Greenhouse, field, and laboratory studies involving purslane (*Portulaca oleracea* L.) were conducted in cooperation with AFSRC scientists and personnel at the NRCS Plant Materials Center at Alderson, WV. Accessions having a desirable growth habit and chemical composition were selected for use in breeding efforts to maximize the expression of these characteristics and for evaluation in agronomic studies. The anthelmintic potential of purslane is in the process of being assessed by MSU Medicinal Botanicals Program and AFSRC personnel. Other investigations focused on propagation, cultivation, and utilization of native herbs, including groundnut (*Apios americana* L.). This project allowed MSU and ARS to join forces to conduct research and outreach activities that helped promote growth of agricultural enterprise and expand education and economic opportunities in the Appalachian Region. This project was aligned with NP 207 and NP 205.

### **Major accomplishments over the life of the project**

- The Program cooperated with local small-farm owners to conduct on-farm research projects with herbs and medicinal plants such as purslane (*Portulaca oleracea* L.), ginseng (*Panax quinquefolium* L.), false unicorn (*Chamaelirium luteum*), and Virginia snakeroot (*Aristolochia serpentaria* L.).
- Since 2002, MBP personnel with their partners have organized and conducted five symposia on medicinal and aromatic plants. These events have promoted the visibility of the Program country-wide, facilitated staff interactions with researchers, producers, and practitioners, and provided opportunities to transfer information to all segments of the medicinal plant industry. The Proceedings of symposia 1 through 4 have been published; the Proceedings for symposium 5 is in press.
- Eight hands-on workshops on propagation, marketing, and use of medicinal plants have been offered to the public during the course of the project. These workshops have provided a mechanism for technology transfer and networking opportunities for participants.

- Since 2003, the MBP has published a monthly newsletter, *The Herbal Dispatch*, which is now distributed electronically and by U.S. mail to more than 550 national and international subscribers. The newsletter is a vehicle by which program developments and activities are communicated to customers, partners, and stakeholders.
- The MBP maintains a comprehensive, dynamic website (<http://www.mountainstate.edu/usda/>) that includes information on all aspects of the Program, including research projects, science courses, symposium materials, newsletter archives, and links to the ARS-AFSRC and the WVHA web sites.
- An MBP-sponsored internship enabled an MSU student to conduct collaborative research on goldenseal with an AFSRC scientist. Contacts made by the student increased the visibility of the MBP throughout southern West Virginia. Results of this research were presented by the student at the 4<sup>th</sup> Appalachian Opportunities Symposium held on September 16-17, 2005, in Beckley, WV, and published under the title “Diversity in indigenous and cultivated goldenseal populations in southern West Virginia” in the proceedings of the symposium in 2006.
- The Program Director, Dr. Mario R. Morales, and the Coordinator, Dean Myles, in collaboration with David C. Carman, a local small-farm owner, wrote a manual on ginseng (*Panax quinquefolium* L.) discussing cultivation and conservation practices. The manual details tips for success not available in other publications. The manual was published by the MBP in 2005.
- The curriculum for a Bachelor of Science degree in Herbal Sciences was developed and approved by the MSU Administration. Efforts were made to recruit students to start classes in the fall of 2005, but low enrollment of students prompted the administration to cancel the bachelor degree.
- In 2005 the Program entered into partnership with the West Virginia Herb Association (WVHA) to organize and conduct an herb conference in the fall of each year. Program personnel have been actively involved in the organization of the event and in the delivery of presentations and workshops. The Program has also provided WVHA members technical assistance on aspects of herb cultivation, production, processing, and marketing.
- Native medicinal plants rescued from habitats being destroyed by industrial activities have been transferred to protected areas for educational and research use.
- From August 2002 to August 2003, project activities were conducted by a project coordinator, a project assistant, an office assistant, and a project intern. A medicinal plants consultant was contracted to assist with symposium organization during 2002-2004.
- In September 2003, a naturopathic physician was recruited as Program Director, who was supported by a project coordinator, and an office assistant. The intern was subsequently hired as a horticulture technician. In June 2004, the Director resigned and two consultants were contracted for one year to assist with symposium organization and newsletter editing and publication.
- In August 2004, a Ph.D. research scientist (agronomist/plant breeder) was hired to fill the vacant Program Director position. Since then, Program activities have been conducted with the support of a field coordinator, a laboratory coordinator, and periodic student workers, some of whom were funded by MSU using non-project funds.

- Office space, a Program van, greenhouse and field resources, and classroom space have been acquired to support Program activities. A high-tunnel plastic greenhouse and a portable plant dryer were donated to the Program by the WVHA. Surplus laboratory equipment has been obtained from ARS. Land, greenhouse space, laboratory facilities, and farm equipment shared by the AFSRC enhance collaborative research, education, and outreach endeavors. Research plots at the NRCS Appalachian Plant Materials Center in Alderson, WV, expand field study capabilities.

### **Technology Transfer**

Program personnel were speakers at several meetings, congresses and symposia during the duration of the SCA: Dr Morales was an invited speaker at the Virginia Tech Department of Horticulture Winter Seminar Series 2005-2006, where he discussed the Mountain State University Medicinal Botanicals Program mission, objectives, and approaches; Dr. Morales spoke about “Appalachian herbs: Their environment and healing powers” at the West Virginia Science Teachers’ Association conference held in Glade Springs Resort, Daniels, WV, on November 10-12, 2005; Dr. Morales presented the topic “Purslane: Food and Forage Use” during the 5<sup>th</sup> Medicinal and Aromatic Plants Symposium organized by MSU, USDA-ARS AFSRC, WVHA, and the West Virginia Department of Agriculture in March of 2006; Dr. Morales was a speaker at conferences organized by the West Virginia Herb Association and MBP in 2005 and 2006, with the titles: “Woods-Grown Non-Timber Opportunities” and “Basil Production”, respectively. Dean Myles spoke on ‘non-timber forest products’ during the 2006 West Virginia University Cooperative Extension Spring Landowners’ Conference in Hinton, WV, and on ‘environmental issues’ during the 2005 MBP/WVHA’s fall herb festival. Annually, Program personnel presented displays and conducted demonstrations related to medicinal plants at the outdoor gardens and in the Special Promotions Tent of the West Virginia State Fair; contacts included farmers, gardeners, teachers, and students from West Virginia and surrounding states.

### **Publications**

#### Symposium Proceedings

Morales, M.R. and Foster, J.G. (Eds.). 2007. Proceedings. Appalachian Opportunities: Plants and Plant Systems for Small Farm Product Diversification. Fifth Annual Symposium, Beckley, WV, March 10, 2007. Mountain State University Medicinal Botanicals Program, Beckley, WV. In press.

Morales, M.R. and Foster, J.G. (Eds.). 2006. Proceedings. Appalachian Opportunities: Medicinal and Aromatic Plants—Producing, Using, and Marketing Herbs and Non-Timber Forest Products. Fourth Annual Symposium, Beckley, WV, September 16-17, 2005. Mountain State University Medicinal Botanicals Program, Beckley, WV.

Morales, M.R. and Foster, J.G. (Eds.). 2005. Proceedings. Appalachian Opportunities: Medicinal and Aromatic Plants—Technology Transfer for Growers, Healthcare Providers, and Entrepreneurs. Third Annual Symposium, Beckley, WV, September 22-25, 2004. Mountain State University Medicinal Botanicals Program, Beckley, WV.

Stagg, J.J. and Foster, J.G. (Eds.). 2004. Proceedings. Appalachian Opportunities: Medicinal and Aromatic Plants—Production, Business & Applications. Second Annual Symposium, Beckley, WV, January 15-17, 2004. Mountain State University Medicinal Botanicals Program, Beckley, WV.

Laferty, R. (Ed.). 2003. Proceedings. Appalachian Opportunities: Medicinal and Aromatic Plants—Growing and Marketing Medicinal Botanicals. First Annual Symposium, Beckley, WV, January 23-24, 2003. Mountain State University Medicinal Botanicals Program, Beckley, WV.

### Articles

Myles, D. 2007. Saving wild ginseng, goldenseal, and other native plants from mountaintop removal. *HerbalGram* 73:50-55

Myles, D. and Foster, J. G. 2006. Diversity in indigenous and cultivated goldenseal populations in southern West Virginia. p. 57-62. In M.R. Morales and J.G. Foster (eds.) *Appalachian Opportunities: Producing, Using, and Marketing Herbs and Non-Timber Forest Products*. Proceedings of the Fourth Appalachian Medicinal Plants Symposium, September 16-17, 2005, Beckley, WV. Mountain State University, Beckley, WV. ARIS Log # 193797

### Booklets

Carman, D.C., Myles, D. and Morales, M.R. 2005. *Ginseng Cultivation and Conservation Practices*. Medicinal Botanicals Program, Mountain State University, Beckley, WV

### Newsletter

The Herbal Dispatch, Vol. 5, Issues 1–06; Jan–Jun, 2007

The Herbal Dispatch, Vol. 4, Issues 1–12; Jan–Dec, 2006

The Herbal Dispatch, Vol. 3, Issues 1–12; Jan–Dec, 2005

The Herbal Dispatch, Vol. 2, Issues 1–7 & 11–12; Jan–Jul & Nov–Dec, 2004

The Herbal Dispatch, Vol. 1, Issue 12; Dec, 2003

### Popular Press Articles about Program Activities:

- 1) Eanes, A. 2005. MSU Medicinal Botanicals Program scores another hit with successful symposium. *Mountain State University Magazine*, winter 2005, Beckley, WV, p14.
- 2) Blankenship, J. 2005. Fascination with medicinal herbs helps man dispel backwoods myths. *The Register-Herald*, (Yearbook 2005), Beckley, WV, Sept. 24-25, p 8.
- 3) Tuckwiller, T. 2004. Mountaintop minding—Ecologist leads effort to rescue plants on mining, logging sites. *Sunday Gazette-Mail*, Charleston, WV, Sept. 5, 2004, p B1.
- 4) Blankenship, J. 2004. MSU home to medicinal garden research site. *The Register-Herald*, (Yearbook 2004), Beckley, WV, Sept. 25-26, p 8.
- 5) Blankenship, J. 2004. New walking trail to showcase native Appalachian plants. *The Register-Herald* (Yearbook 2004), Beckley, WV, Sept. 25-26, p 8.
- 6) Eanes, A. 2004. Saving our Herbal Heritage. *MSU today* 2 (2):8-9.