Jujube and Aronia

Introduction
Jujube (Ziziphus jujube) and black aronia (Aronia melanocarpa) are minor fruits that could have commercial potential in some areas of Kentucky. Growers looking for unique crops to add to their product mix may want to consider these novel fruits on a small scale.

Jujube is a 15- to 30-foot deciduous tree native to China. Also known as Chinese date, jujube produces round to elongate fruit ranging from cherry-sized to plum-sized. Adaptable to a wide range of temperatures, jujube has a low winter chill requirement to set fruit. Trees are generally considered to be hardy to minus 10° F. Rich in vitamin C, the versatile jujube fruit can be eaten fresh, dried, and in a number of value-added products.

Aronia, also known as chokeberry (not to be confused with chokecherry, Prunus virginiana), is a hardy, vigorous plant native to Eastern North America. The purplish-black fruit is approximately ¼ to ½ inch in size and borne on a medium to large shrub that can be 5 to 10 feet tall. The astringent fruit, which is very high in several healthful compounds, is being used in the food industry to add color and/or antioxidants to other juices, such as apple and grape. Aronia fruit is also used in making wine, jam, syrup, yogurt, and tea.

Markets
Potential markets for jujube and aronia include farmers markets and Internet sales. Jujube could also be marketed to Asian markets and restaurants. Dried jujube can replace raisins or dates in snacks and baked goods. Because aronia is not suitable for direct fresh sales due to its astringency, growers need to market this fruit in value-added products. Aronia berries may also have potential as an item for the local smoothie industry.

Marketing Outlook
Marketing jujube and aronia will be a challenge since many consumers will be unfamiliar with them. While some Kentuckians may recognize the name chokeberry, promoting this crop as aronia could be more effective than using a name with “choke” in it. Introducing the crops through farmers markets, local food networks, or community supported agriculture (CSA) subscriptions may prove effective marketing strategies. Product sampling and point-of-purchase materials about handling and use would need to be included upon sale of fruit or fruit products. For jujube, product introduction...
in communities with substantial Asian ethnic populations may help increase awareness and demand of local fresh product.

Aronia and jujube have positive health aspects, and these characteristics may help grow markets for both crops among more health-conscious American consumers. The fruit of both crops are high in vitamin C. In addition, aronia can be promoted as a healthful fruit due to its high nutrient and antioxidant content; producers must exercise care to adhere to food marketing guidelines when making any health claims about such crops. Aronia fruit are more likely to be developed in areas where multiple producers can harvest crops for processing, while jujube may be well-suited for development as a niche market crop for fresh markets, similar to gooseberries or currents.

**Production Considerations**

**Cultivars**

Hundreds of cultivars of jujube are available in China and other Asian countries; however, the selection for U.S. growers is much more limited. Jujube generally has 2 spines at the bases of leaves; however, some virtually thornless cultivars have been developed. Cultivars also vary in fruit shape (round to elongate), flavor (level of sweetness), size (cherry to plum size), earliness, as well as tree form (upright, weeping, and zigzag branching pattern) and size. Self-compatibility is often uncertain so it is advisable to plant two or more different cultivars in the orchard to provide for cross-pollination and to increase yields.

Little information on aronia cultivar performance is available for commercial producers. At least one Kentucky-owned and operated orchard/nursery does sell several jujube cultivars and may be able to provide cultivar selection guidance based on experience with their own orchard.

Select *aronia* cultivars based on their fruit productivity. While many cultivars are intended for ornamental use, there are several that are prized for their uniform fruit size and high yields. Some commercial clones developed in Eastern Europe, such as Viking and Nero, are now available in the U.S.

**Site selection and planting**

**Jujube** is a relatively undemanding tree adaptable to various soil types, as well as a range of soil pH. Trees will even tolerate poor soils as long as they are well drained. While jujube is somewhat drought-tolerant, regular watering is recommended for the best fruit quality. Pruning is not necessary to enhance fruit yields, but winter pruning does help promote tree health and manage tree size. A low chilling requirement means that jujube will produce fruit even after a mild winter. Jujube blooms late enough that it should escape spring frost injury. A Kentucky jujube grower suggests an in-row spacing of 15 feet and a between-row spacing of 20 feet. Tree spacing can depend on equipment and the ultimate size of mature trees. Cultivation under trees is not recommended since root injury induces undesirable sucker formation many feet from the parent tree.

**Aronia** prefers neutral to slightly acidic, well-drained soils located in full sun. Plants are not very drought tolerant so supplemental irrigation may be needed. Barerooted seedlings should be planted in spring after all threat of frost has passed. Containerized aronia can be planted into midsummer as long as plants are provided
with adequate moisture. Spacing depends on harvest method (hand or mechanical), production system (hedge system or individual plants), and equipment. At an in-row spacing of 3 feet, aronia will spread via suckers and create a dense hedge within 3 to 4 years. Larger spacing is used when it is desirable to maintain individual shrubs. The recommended between-row spacing ranges from 8 to 14 feet, depending on equipment/harvester requirements. Established plants are pruned annually to maintain a suitable height for harvest and to increase productivity.

**Pest management**
Aronia and jujube are relatively disease-and insect-free in the U.S., making them potential candidates for organic production. Weed management within rows is most important the first few years during plant establishment. Aronia fruit are attractive to deer and birds.

**Harvest and storage**
**Jujube** may bear a very small number of fruit the first season; however, it is more common for production to begin the second or third year. Reasonable harvests can be expected after 4 to 5 years. Fruit will not ripen all at once on the tree and must be picked every few days over the course of a month or more. Immature green fruit turn yellow-green or whitish-green and become mottled with mahogany-colored spots before fully ripening to a reddish-brown color. Once fully ripe, fruit will begin to wrinkle as they soften and lose moisture on the tree. Green jujube fruit does not ripen satisfactorily off the tree; however, once at the yellow/white stage, fruit can be ripened at room temperature. The sugar content of fruit ripened off the tree will not be as high as those allowed to fully ripen on the tree. Fruit for fresh use is generally harvested by hand sometime after the first brown color appears, but before fruit begins to wrinkle. Fresh fruit can be stored for a week to a month, depending on the temperature and relative humidity. Fruit for drying is best harvested when fully mature; dried fruit can potentially be stored indefinitely.

**Aronia** may bear a small crop one year after rooted cuttings are planted; however, production normally begins in the second or third year. Yields increase each year until plants reach maturity in approximately 5 years. Berries are hand-harvested by cutting off fruit clusters. Fruit can also be harvested with a mechanical blueberry harvester. Aronia berries are less tender than blueberries and therefore less prone to injury during transportation to market.

**Labor requirements**
For aronia, labor needs are estimated at 50 to 75 hours for establishing 1 acre. At a production level of 18,000 pounds, using a mechanical harvester, annual labor needs for aronia will be 15 to 25 hours for production, 65 hours for harvest, and 65 hours for (packing/grading). Machine harvest is more efficient for areas of 1 or more acres. Hand harvest of aronia berries requires about 1 hour for every 16 pounds harvested.

**Economic Considerations**
Initial investments for perennial crops include land preparation, purchase of plants or trees, and installation of an irrigation system. Additional investments include harvest containers, packaging and transportation costs, and may also include wildlife, bird, and pest control.

Economic returns for jujube will depend on the price paid per tree and the price obtained per pound. Producers should develop their own cost and return estimates based on budget templates that are available for tree fruit and nut crops, such as apples or pawpaw. Relatively high prices per pound may be required to recoup establishment costs and generate economic profits.

For aronia, economic returns will vary considerably based on marketing channel and production methods for berries grown in small plots (less than 1 acre). Producers should adapt a budget template from another perennial or berry crop, such as gooseberry or red raspberry, to estimate profitability. Having value-added
product channels is key for realizing positive returns for a new crop that is not ideal for fresh sales, like aronia berries.

For plots of 1 acre or more, an interactive aronia production budget assuming mechanical harvest has been developed by Iowa State University Extension. The Iowa budget estimates were adjusted for a 2013 Kentucky scenario. For the planting and pre-production years, total planting and establishment costs (including labor) are estimated at $10,000 per acre. Returns over total costs are estimated at $1,193 for Year 3, the first production year, and $6,690 in Year 4. From Year 5 forward (full production years), annual returns above total costs are estimated at $9,333. These estimates assume a yield of 18,000 pounds per acre and the availability of a mechanical harvester at an estimated harvest expense of $0.21 per pound.

Selected Resources

Jujube
• England’s Orchard and Nursery http://www.nuttrees.net/
• Jujube: Chinese Date in New Mexico (New Mexico State University, 2012) 6.36 MB file http://aces.nmsu.edu/pubs/_h/H-330.pdf

Aronia
• Aronia (Black Chokeberry): Culture of Aronia for Fruit Production (University of Maine) http://umaine.edu/agriculture/home/aronia/culture/
• Aronia Berries Profile (Agricultural Marketing Resource Center, 2012) http://www.agmrc.org/commodities__products/fruits/aronia_berries_profile.cfm
• Culture of Aronia Black Chokeberry for Fruit Production (Blueberry Croft Farm and Nursery Blog, 2011) http://blueberrycroft.com/blog/?p=514
• Demand Increasing for Aronia and Elderberry in North America (Cornell University, 2004) http://www.fruit.cornell.edu/berry/production/pdfs/aroniaelderberry.pdf
• Fruit and Vegetable Production Budgets: Aronia (Iowa State University, 2011) http://www.extension.iastate.edu/agdm/crops/html/a1-17.html

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Reviewed by John Strang, Extension Specialist (Issued 2013)
Photos by Clifford England, England’s Orchard and Nursery in McKee, Kentucky (jujube) and Goku, Wikimedia Commons (aronia)