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Bulletin of The Desert Legume Program of The Boyce Thompson Southwestern Arboretum and The University of Arizona

Volume 20, Number 3 November 2009

Unique Legumes on the University of Arizona Campus Part IV

Elizabeth Davison, Director
UA Campus Arboretum
School of Plant Sciences
University of Arizona

Note...The write-ups on the following three species originally appeared in the trade news Southwest Trees and Turf, published in Las Vegas, Nevada.

Acacia papyrocarpa – Western Myall

The territories of Western Australia and Central Australia comprise the Great Victoria Desert. With a rainfall average of less than nine inches, and in some places half that, this dry land is home to some of the toughest plants on earth. These species (many of them legumes) are winners in the ever-increasing heat of the American Southwest.

Acacia papyrocarpa hails from this region. Known as Western Myall, it has all the outward characteristics of a tough tree: stick-like gray foliage, spreading canopy, and extremely hard seeds.

Western Myall is a multi-stemmed shrub/small tree that can grow to over 20 feet tall, with spreading flexible branches that are often pendulous. From afar it looks like a blue cloud. The bark is rough and fissured, and the flattened branches hang low.

Phyllodes (modified leaves) resemble needles, from 1.5 - 4.5 inches long. They are flat, and end in softly curved innocuous tips – no need to be wary of their appearance. The phyllodes are spaced ½ inch apart, giving each branch a "loose" appearance – no doubt functioning to disperse heat load. The shade, therefore, is light and dappled.

Flowers are small yellow puffs, 2 to 5 clustered together in the leaf axils. Their bright yellow is a perfect foil for the dusty blue of the foliage. Flowering time is early spring in Tucson, February into March.

Fruits are legumes, 3-4 inches long, papery, with a width of about 1/4 inch. They are flat, and are slightly raised and constricted between the seeds. The seeds are small, black, slippery and very hard.

According to **worldwidewattle.com**, a most useful website for Australian Acacias, Western Myall is adaptable to a range of soils from sandy loam to clay, in high pH sites, in open woodland or shrubland. Uses for most of the Australian Acacias can be found on this site, too. While seeds of many acacias are known to be edible, other potential uses for this genus include revegetation, for medicine, and for timber. The wood of *Acacia papyrocarpa* was used by the Aborigines, and may still be, for musical instruments and tools.

An interesting question is what prevents Western Myall seedling establishment in its native range. Seeds fail to germinate in most years. A paper (Ireland, 1992) addressing the lack of seedling emergence noted that ants (various

Acacia papyrocarpa blooms (ED)

species) normally carry seeds off and destroy them. (This seems to have happened on the UA campus). A combination of events must occur for seedlings to establish: high late-summer rains, combined with sheeting water flows which scarify the seeds – and presumably flush out ants, shallow burying of seeds, follow up rains that encourage seedlings, and low herbivore populations. In Western Australia, these events only occur together, on average, every 20 years. Growers should try to mimic these conditions, of course.

The UA's *Acacia papyrocarpa* was planted on campus during the Warren Jones era of "interesting tree experiments" in the 1980s. In the 20 years or more on the site, it has stretched, flopped, draped and spread to about 16 feet wide. On the west side of Yavapai Hall, it gets full afternoon sun and reflected heat until about 4 pm in summer. This site has been a good one; the tree has rarely suffered through a killer summer, and more importantly, seems to be hardy down to the mid teens.

In landscaping, Western Myall is a blue cloud that would certainly catch one's eye. It is only moderately messy, since the leaves/phyllodes hang on for many seasons. This is one of those plants that probably would never look better with pruning. It could be used as a focal point, but would need room to spread. But more importantly, this thornless tree is tough as nails, and withstands our increasingly hot summers with nary a whimper.

***Colophospermum mopane* – Mopane, turpentine tree**

Drought, animal predation, high winds, hot sun, long days…most African trees that are used in the Desert Southwest look as if they could withstand anything. Here's one that doesn't fit the mold. We are evaluating it on the University of Arizona campus in Tucson.

Colophospermum mopane is a beautiful "soft" appearing tree that, if successful on campus, will be one of our prize trees. Right now it's a newly-established baby, grown for us by the Desert Legume Program in Tucson.

According to an excellent website, Plantzafrica.com, the species is native to the drier, warmer areas of Namibia, Botswana and Zimbabwe, in the 20° to 30° latitudes. Summer rainfall is common. Soils are alkaline and not particularly well draining. (Sounds like the urban southwest!) Perhaps with protection, or the right microclimate, this tree might be a good ornamental tree for the USA's southwestern cities.

C. mopane has a range of forms, from shrub-like to a tree reaching 30 meters high, probably depending on soil conditions or water availability. One photo on the internet showed a form reminiscent

Colophospermum mopane (ED)

of a big spreading oak. Others show a more columnar form.

According to Matt Johnson of the Desert Legume Program: "It got down to 23° F at the Yuma Mesa Ag Center in January 2007… One of the (*Colophospermum mopane*) trees appeared to be totally unaffected while the other two showed only superficial damage (twig tips and some burning of outer leaves). Based on that very limited test, I would think that they would generally handle down to 20° F with minor damage (foliage killed and outer twigs damaged), but would expect more extensive damage at lower temperatures. To be on the safe side, I generally consider them to be reliably hardy to 25° F."

Another great website is Google Books, where I found How to Identify Trees in Southern Africa. According to the author, Braam Van Wyk, *Colophospermum mopane* sports late-spring blooming green flowers and is one of the few wind-pollinated trees in that part of the world. To facilitate pollination, trees tend to form large stands, called Mopane velds, loved by animals and birds.

Again, notes from Matt Johnson: "…our trees have been producing pods each year for over a decade. The seeds are interesting too, in that they need to remain in their wing-like pods and are planted (or fall in nature) on the soil surface with only a slight covering of soil where they germinate."

Partially deciduous during the dry winters, Mopane leaves are really beautiful. Photos from the internet vary widely, indicating some plasticity in form, depending on conditions. They are similar to a Bauhinia's leaves, except that with harsher conditions, they can be narrower, resembling an Acacia's phyllodes. Protein rich, the leaves have a turpentine smell and are browsed by game animals, particularly elephants. The UA's tree has juvenile leaves that appear soft, but those might change after a few hot summers.

One very important part of the tree's ecology and cultural history is the fat larvae of an emperor moth (*Imbrasia belina*) which commonly feed on the tree's leaves through the growing season. These caterpillars get to be over 4 inches long and are harvested as a delicacy by the folks in Africa. Other tree parts that are utilized include its hard wood (for timbers, fences, houses), its bark (for twine and tanning), its leaves (healing wounds), and twigs (chewed as toothbrushes).

So – maybe we've got a winner, if the global warming trend continues, and this winter is milder than usual. In any case, our little Mopane seems to be adapting well, and we hope for the best!

***Faidherbia albida* – Apple ring acacia, White thorn, Ana tree**

African dry-land trees are known the world over as being tough – resistant to drought and periodic flooding, tolerant of wildlife browsing, able to re-sprout from stumps, and adaptable to many altitudes and soil conditions. One of the best of these "survivors" is the Ana tree (also called White thorn or Apple ring), *Faidherbia albida*. What a survivor it is!

Apple ring trees are found in dry valleys which receive virtually no rain, as well as in places receiving up to 70 inches (180 cm). From the Sahara to South Africa, including the dry Namibian desert, they survive and continually re-sprout in old river systems and alluvial plains.

It's also tolerant of both frost and intense heat, growing from sea level to elevations of 8000 ft (2600 meters). In all situations, its foliage provides browse for animals, shade for humans, and shelter for other plant species.

One of the giants of the "Acacia" trees in Africa, *Faidherbia* reaches up to 80 feet (25 meters) tall in the lowest warmest sites. The form is variable, from cone-shaped to oval to spreading. The University of Arizona's specimen is approximately 25 feet tall, not too tall for a giraffe to browse.

Bark is gray and fissured. Young branches and twigs are cream colored to whitish, with pairs of straight, white axillary spines. Leaves are bi-pinnate, with 3-12 pairs of pinnae, each holding 6-23 pairs of leaflets. Presumably the

Faidherbia albida (ED)

morphology changes with climate/ environment. Flowers are typical dense spikes 3 - 4 inches (7-10 cm) long, cream colored and fragrant. Pollinators are bees and other insects.

Faidherbia fruit is a dry legume pod, about 1 cm wide, with a tightly curved shape (thus the Apple ring" name). Shapes and sizes can vary between trees but most pods are reddish and very nutritious (high protein values per unit weight of pods and seeds). One source states that Ana trees can produce between 10 to 150 kg of nourishing dry pods years. (Hoanib River Catchment Study, Desert Research Foundation of Namibia).

The Apple ring tree has an unusual phenology: it leafs out in the dry season, but loses its leaves in the wet season – a characteristic that makes the species important for forage, for both domestic livestock and wildlife. In places with a predominance of domesticated herds, the "browse line" is low, and herders encourage animals to spend time under the trees. In contrast, where elephants and giraffes are the common animals, the "browse lines" are too high for domesticated stock, so herders often shake the trees or remove branches and pods for their herds. Branch removal for leaves or firewood has been found to cause re-sprouting and thicker foliage that lasts longer into the wet season.

This unique phenology has also allowed humans to improve crop production. Where the leaves remain on the trees nearly all year, other plant species can establish in the shade of the canopies. Studies supported by the World Food/ Agriculture Organization (among others) show that millet, coffee, and other subsistence crops grown under *Faidherbia* trees produce

Faidherbia albida thorns (ED)

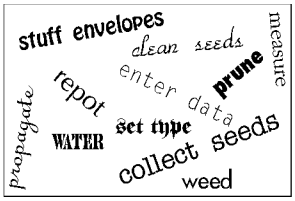
nearly double the yields compared to the same crops grown in treeless fields. Undoubtedly falling leaf litter and canopy shade at planting time creates an improved microclimate. Higher nitrogen levels result from both leaf decomposition and animal wastes beneath the canopies.

Other uses for this fast-growing tree include human nutrition, firewood (although, thankfully, it is not of the best quality), some carpentry, thorn fences, bee culture, local medicines, and toothbrushes.

Overall, this is a species that's been cultivated, cared for, and utilized all over Africa for generations. It is valuable for its consistent enhancement of dry lands, for improvement of animal husbandry and subsistence farming, for slowing of desertification, and for ethnobotanical value.

The UA's Apple thorn tree is another "experiment" from the years in which Warren Jones taught and evaluated trees on our campus. It is located at the northwest corner of a building formerly known as Purchasing/Stores, but now called Math East. Its potential for lateral growth is restricted, but there's an opportunity for increased height. With reduced construction activity, and afternoon shade, its future looks very good. Now if we only had a giraffe!

Staff and Volunteers in Action



Volunteers: The Desert Legume Program's Nucleus

The majority of our volunteers are retired professionals from many disciplines, people who still actively enjoy the sciences and participate in a wide variety of activities. While volunteer sessions have been smaller this fall than in most years, there is a low rate of attrition from our group. The group's size changes when individuals are no longer able to participate, sometimes due to illness or death or when new members join the group. I believe that volunteers are the DELEP "nucleus".

In Tucson the All Souls Day procession provides a good opportunity for celebrating the lives of those who are no longer with us. In that spirit, I want to dedicate this article to our volunteers who have died over the years. Hazel Lee, wife of longtime volunteer Cesar Lee, passed away in October 2009. Hazel volunteered for DELEP for many years. We extend our condolences to Cesar, and to the Lee family. Whether they volunteered for years or for a brief period, the participation by our deceased volunteers helped us to reach our goals. These individuals include: Tish Adams, William Bearly, Carl Cameron, Mary Church, Myrtle Ethington, Tracy Everingham, Charles Hoffman, Ted Hollander, Herb Hull, Emily Johnson, Warren Jones, Jack Kaiser, Robert Kneebone, Hazel Lee, Horace Miller, John Payne, Anne Poppy, Danny Stacks, T.C. Tucker, Jean Weber, Robin Young and Alan Young. Clyde Adams, Karl May and Ed Weber are three of our original volunteers and still attend volunteer sessions. The majority of our volunteer group have been active for over ten years. In October we welcomed a new volunteer, Jean McCabe. Thanks to Kay Fagan for recent powerpoint presentations at the monthly sessions.

"UA News", a news service of the University of Arizona, recently reported on volunteer participation in the National Phenology Network (NPN) and "PROSE", the Phenology Research and Observations of Southwest Ecosystems. To learn more about the NPN, visit the website www.usanpn.org. I have been maintaining plant phenology records of our Tucson fields for the past five years, recording flowering and fruiting data.

Upcoming volunteer sessions are November 18 and December 9. Tentative dates for 2010 are January 13, February 10, March 10, April 14 and May 12. Please contact me to learn more. KC

Mark Siegwarth
Director DELEP

In this age of tight budgets, citizens in Arizona and throughout the nation are debating what services government should provide. This is a healthy debate and one I personally agree is worth having. It is a somewhat difficult debate as we ponder what we can afford. Our nation culturally is uncomfortable with settling for the status quo or doing less than before. Much like a football team, no one trains or works hard to come in second, yet in facing our current budget crisis, this is where we find ourselves.

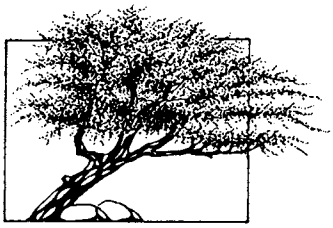
The aspect of the debate I find most troubling is the focus on the present and not the future. A while back, when I was advocating for the preservation of a tract of land to become a state park, I was asked if we could not preserve it ten or twenty years from now. It was clear to me the other uses contemplated for the land would preclude any future preservation efforts. But the argument remained, without any tangible benefits today, how could preserving the land today be worthwhile?

The Desert Legume Program (DELEP), by its nature, does not preserve only seeds that may have some commercial or academic value this year. Its mission is to preserve seeds not only for today but for the future as well. As our climate evolves, these seeds may be the tools needed to cope with new diseases or provide the crops of the future. Too often in these budget discussions, investing in the future focuses on educating our children but neglects to provide them with the tools they may need. Deficit spending by the government is seen as stealing from our grandchildren but not preserving the rich biodiversity of our age is also stealing from them, one species at a time.

DELEP has made great strides in the past 21 years. We have established a major collection of legume seeds from the world's dry regions. The seed bank currently includes 1,354 identified species in 221 genera. This unique and valuable collection of germplasm is shared with private individuals, researchers and organizations across the U.S. and around the world. With biodiversity loss and threats posed by climate change, germplasm collections such as those maintained by DELEP are increasingly important. Safeguarding and developing the seed bank is central to DELEP's mission.

In spite of these great strides, DELEP needs your help. In response to economic conditions, we have reduced our budget by 12% since 2008. In addition, the percentage of our budget funded by contributions will grow to over 50% next year. Your contributions are critical for us to continue our efforts to move the program to a higher level of excellence and to serve the global community. I hope you agree that our mission is critical today and that your support reflects the importance of our mission to you. You are always welcome to contact me with questions regarding DELEP. Thank you again for your support.

Acacia papyrocarpa at West Campus (KC)



Opportunities for Participation

DELEP's bulletin Aridus, is published three times annually to stimulate interest in desert legumes, to inform our readers of DELEP's activities, and to encourage support for DELEP's programs. Manuscripts related to legumes are welcome and should be mailed to the editor for review. Subscriptions are complimentary and are available by contacting the DELEP office. Aridus is published by The University of Arizona on behalf of The Desert Legume Program.

Financial support for DELEP is provided by private industries, government agencies and individuals through contracts, grants, and contributions. Dedicated volunteer work is an integral component of DELEP. Our volunteers have many different backgrounds and work on various projects including wild seed collecting, seed processing, special events and office tasks. DELEP volunteers meet once a month. To volunteer call (520) 647-2460 or email kcoppola@ ag.arizona.edu

To Contribute:
Call to discuss a pledge, restricted gift, or estate planning.

Make a check payable to
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Mail to Desert Legume Program
2120 E Allen Road
Tucson AZ 85719

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2120 East Allen Road
Tucson, Arizona, 85719
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Return Service Requested

Colophospermum mopane in Yuma Field (KC)

Faidherbia albida at Yuma Field (KC)