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Are Carob Trees Nitrogen Fixers?

Are Carob Trees Nitrogen Fixers?

Carob is a fantastic tree for California, and other places with a Mediterranean climate! I have great interest in d food plants (oak, walnuts, chestnut, olive, carob, fig, grape, pomegranate, caper. . .) so here is a rather lengthy dug up in my research on carob over the years, I hope you find useful:



Young, productive carob tree

Mixed stories indeed, regarding the question of N-fixing in Carob. I don't think anyone knows 'for sure'. In fact, w soil life/plant root interactions. We are now learning more, but the complexity is vast.

I do know that Carob is a greatly useful and productive (nutritious pods and seeds, beautiful hard wood), a long l alkaline conditions, being limited by it's frost sensitivity (about as hardy as sweet orange), and intolerance of po

It has a very deep taproot that is essential to finding water late in the dry season. To avoid stunting small trees to root, many have suggested direct seeding in the field. Alternatively, seedlings are grown in 3 foot long tubes, 3 inches bound together for growing in the nursery. Later when planting in the field, it is much easier to extract the root variable, and selected varieties are grafted onto them. Hermaphroditic or male trees are essential for pollination a branch of such pollinator grafted onto females. They are slow growing, beginning to bear in 5 years, full productivity tendency to irregular bearing. The center of diversity is Portugal, Spain and Italy, thus perfectly adapted to agro parts of California.

A must read is the 1929 classic book *Tree Crops- A Permanent Agriculture*, by J. Russel Smith (it's subtitle obviously create the word 'permaculture')

A pdf of entire book available online at :

<http://www.soilandhealth.org/01aglibrary/01principles.html>

The carob tree is thoroughly praised in this book in

Chapter 6. A Stock-Food and Man-Food Tree -- The Carob

Also be aware of the unfortunate 1920's racism, occasionally found in his prose, in this otherwise inspirational book

Back to the question of N-fixing:

Legumes (botanical family now known as Fabaceae, used to be Leguminosae) are the third largest family of flowering plants (Orchidaceae (orchids) and Asteraceae (sunflower and daisy family)), with 730 genera and over 19,400 species, according to Gardens.

The three sub-families of these legumes are:

Faboideae (pea like flowers)

Mimosoideae (puff ball like flowers)

Both these sub-families have 90% Rhizobium symbiosis

Lastly,

Caesalpinioideae (five petals on flowers)- only 34% Rhizobium symbiosis

So, perhaps only a 1 in 3 chance of n-fixing nodules in the subfamily Caesalpinioideae, where carob is found.

Here are some of the cons and pros in the literature:

I recommended this publication/manual, which is against the carob n-fixing, that notes it does have a root symbiosis the mycorrhizae:

Promoting the conservation and use of underutilized and neglected crops. 17- Carob tree. Ceratonia siliqua L

<http://www.ipgri.cgiar.org/publications/pdf/347.pdf>

relevant excerpt:

Although the carob tree is a legume, like most Caesalpinioideae it does not nodulate and thus is unable to fix nitrogen (Martins-Loução and Rodríguez-Barrueco 1982; Martins-Loução 1985). Arbuscular mycorrhizal (AM) fungi have been shown to colonize carob roots, but no ectomycorrhizal association was found (Martins-Loução et al. 1996b). The colonization by AM can increase nitrogen uptake by the plant. Since carobs often grow on nutrient-deficient soils lacking nitrogen and phosphorus in particular, AM fungi can improve nutrition.

These two excellent sources don't say either way:

Purdue has the entire book '*Fruits of Warm Climates*' online:

Carob chapter at

<http://www.hort.purdue.edu/newcrop/morton/carob.html>

World Agroforestry Tree Database- entry on Carob:

http://www.worldagroforestrycentre.org/SEA/Products/AFD_bases/AF/asp/SpeciesInfo.asp?SpID=509

The only claims that Carob does fix nitrogen, that I could find, are here:

List of plants with nitrogen fixing nodules, with references:

The Bean Bag, Number 49, February 2002, Nodulation and Nitrogen Fixation, Joseph H. Kirkbride, Jr.

<http://74.125.155.132/search?q=cache:oYPUNU2uSykJ:www.kew.org/herbarium/legumes/beanbag49/nodulation+nodule&cd=35&hl=en&ct=clnk&gl=us&client=firefox-a>

Original reference cited in above list:

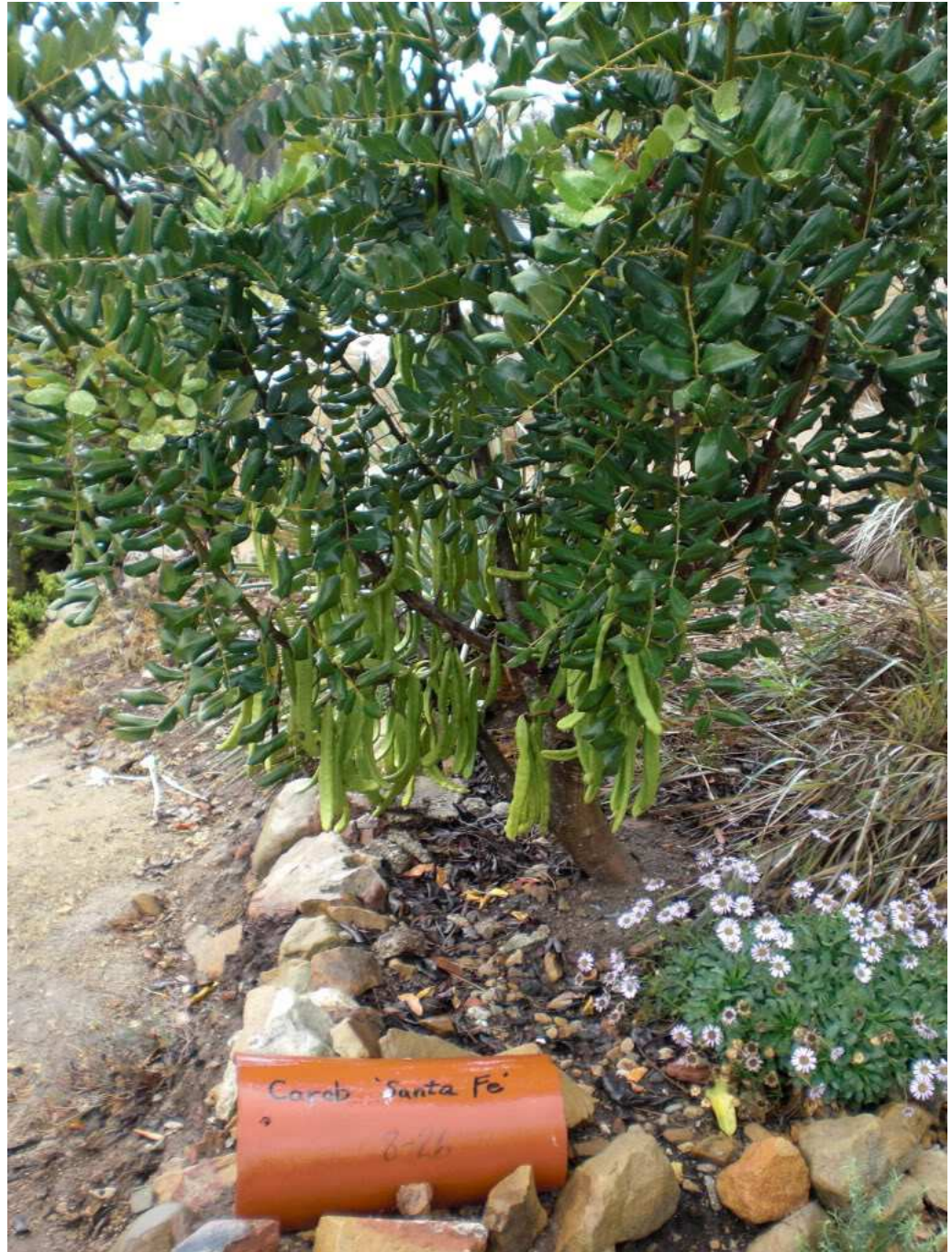
Idrissi, M.M. El, Aujjar, N., Belabed, A., Dessaux, Y., and Filali-Maltouf, A. 1996. *Characterization of rhizobial strains (Ceratonia siliqua)*. Journal of Applied Bacteriology 80:165-173.

<http://www3.interscience.wiley.com/journal/119957824/abstract>

Click on the 'Full Text PDF' tab to download the article.

Or I can email the pdf to you, if you have trouble downloading it.

All in all, Carob is an unequalled tree worth planting, nitrogen fixing or not.



'Santa Fe' Carob tree with roof tile label, 'La Huerta' Santa Barbara Mission

Some other fertility considerations:

In addition to the huge number of legumes that fix nitrogen. . .

Some non-leguminous plants that fix nitrogen:

Actinorhizal plants symbiotic with Frankia spp. include 22 genera (with some native Californian chaparel plants: *Cercocarpus*):

Betulaceae: *Alnus*; Casuarinaceae: *Gymnostoma*, *Casuarina*, *Allocasuarina*, *Ceuthostoma*; Coriariaceae: *Coriaria*; [Elaeagnaceae: *Eleagnus*, *Hippophae*, *Shepherdia*; Myricaceae: *Myrica*, *Comptonia*; Rhamnaceae: *Colletia*, *Discaria*, *Talguenea*, *Trevoa*, *Ceanothus*; Rosaceae: *Dryas*, *Purshia*, *Cowania*, *Cercocarpus*, *Chamaebatia*)

Also nitrogen fixing cyanobacteria (bluegreen algae) symbionts:

Some lichens, *Azolla* spp., Cycads and *Gunnera*

When focusing on fertility, and improving soil life, as a function of a particular plant, in addition to nitrogen fixation, general biomass productivity, and vigor, leaf texture and woodiness, and decomposition rates, as it relates to mulch management, ability to act as a dynamic accumulator- concentrating minerals and other nutrients.

Of late, I am interested in comments by a friend mentioning Elaine Ingham's recent reports on the benefits of Lo

woody aromatic herbs at part of soil health. I recently have heard Michael Philip speaking on organic orchard ca ramial chipped wood (RCW, small diameter hardwood branches) for mulching (feeding) the soil.

Related, see Jean Pain, as the similar plants, climate, and fire danger are parallel to California's. See:

<http://www.youtube.com/watch?v=JHRvwnJRNag>

And:

<http://www.biomeiler.at/explorer/Downloads/AnotherKindofGarden.pdf>

Some questions for you:

I see you are from Southern California. I was just down there last weekend- the white sapotes are peaking! Are you on the foggy coast, or a bit inland, or higher elevation above the fog? What other species (guilds?) are you work sources of selected varieties of carob- particularly tasty or productive varieties, or individual trees? I am interested in ideas, and experiences.

Be fruitful,
John Valenzuela

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