Central Arid Zone Research Institute (CAZRI), Jodhpur, India developed a successful technique for tree exudates gum tapping which has been very effective for gum Arabic production from *Acacia senegal* which is widely spread in western part of India particularly in Rajasthan. The technique proved to be very fruitful and got wide spread popularity in western Rajasthan where the gum tappers of the region produced about 23.59 t gum Arabic and earned about 235.9 thousand US$ gross income in 3 years (2009-2011) by sale of gum Arabic in local markets. Adoption of this technique by all gum tappers of gum producing belts of the world will result in enhanced production of gum Arabic in the world and provide better livelihood option for the community.

**Introduction**

Gum Arabic, the oldest and best known tree gum, is a dried exudate obtained from the stems and branches of certain Acacia trees, most often from *Acacia senegal* and *Acacia seyal*. *A. senegal* which has wide ecological amplitude and grows in countries like Mauritania, Senegal, Zambia, Ivory Coast, Ghana, Nigeria, Mali, Burkina Faso, Niger, Central African Republic, Chad, Sudan, Ethiopia, Somalia, Uganda, Kenya, Tanzania, Rawanda, Zaire, Mozambique, Oman, Pakistan and India, is predominant species for gum Arabic production. Most of its stands occur in a wide belt of arid & semi-arid regions of sub-Saharan Africa, North-Western India and Pakistan. However, the gum production potential of this species is still untapped in most of the areas because of unproductive and interest less effort in gum tapping. Traditional method of gum tapping, in which tree is wounded at various parts, is laborious, causes more injuries to the tree and in turn, the tree produces a very low quantity of gum due to which gum tappers have no interests in gum tapping. Recognising the need to enhance the capacities of the gum tappers and to increase the gum Arabic production worldwide, an improved technique of gum tapping was evolved by Central Arid Zone Research Institute (CAZRI), Jodhpur, Rajasthan, India, in which a standard gum tapping technique of CAZRI Proved to be a Boon of Livelihood for Gum Arabic Tappers of Western Rajasthan in India

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inducer solution prepared by CAZRI, commonly known as CAZRI Gum Inducer is used.

CAZRI Technique of Gum Tapping

Materials required
Hand drill or battery operator drill of 18 mm diameter bit, syringe of 5 ml volume, moistened clay and CAZRI Gum Inducer.

Procedure
• A 45° slanted hole of 18 mm diameter and about 3 cm deep is made on tree trunk at 1-2 feet above the collar of the tree with the help of hand drill or battery operated drill machine.
• After that, 4.0 ml dose of CAZRI Gum Inducer is injected in the hole with the help of syringe.
• Immediately after injecting the dose of CAZRI Gum Inducer, the hole is covered (patched up) by moistened clay.
• The tree starts exuding gum tears after 8-10 days of the treatment (step 4 of Fig.1)

The above mentioned procedure is depicted in Fig. 1.

The optimum season for treatment with CAZRI Gum Inducer is from start of summer to onset of monsoon i.e. March to June in hot arid climatic conditions. The yield of gum through this technique is about 500g to 1.5 kg per tree which is almost 25 times higher than that of traditional method.

One should have following some important points to be kept in mind while going for application of CAZRI gum tapping technique:
• One should avoid treating the tree if weather is humid, cloudy or rain is expected.
• The best season to treat the tree starts from after leaf fall to before rainy season.
• The best results are found in trees of more than 10 years old growing in sandy soils or sandy dune habitat.
• The optimum dose of CAZRI Gum Inducer is 4 ml per tree however, it may vary from 4-5 ml according to tree
structural traits, big and wider girth

tree needs slighter more dose quantity
of the inducer.

- One should ensure that while covering
  the hole, the clay has not entered into
  the hole otherwise it would lead to
  outward absorption of the inducer.
  While patching up (covering), press the
  clay from side on outcircle of the hole
  (as shown in step 3 of fig. 1.), not on
  the mid of hole.

Sustainability of the Technique
A technique becomes more popular when it is
more profitable as well as sustainable. CAZRI
has also studied sustainability of its gum
exudation technique and its impact on
livelihood improvement of the people of arid
western Rajasthan. The results of the study
revealed that there was substantial decrease in
gum and seed yields of *Acacia senegal* due to
every year treatment of gum inducer for higher
gum production. After ten years, the quantity
of gum and seed yields was, respectively 43%
and 36% less as compared to those obtained in
the first year of treatment. It showed a
successive reduction in gum as well as seed
yields due to every year treatment of the trees
with the gum inducer. It also showed that gum
inducer treatment for higher gum production
also had the negative effect on seed yield of
tree in next season and the effect was seen
more when trees were treated every year.
Therefore it was recommended that one should
not treat the tree every year with the gum
inducer but in alternate year so that the tree
can sustain its production level as well as its
health.

Adoption of the Technique
Since CAZRI is situated in western Rajasthan,
the benefits of its research first reach to nearby
areas. Therefore, a number of districts of
western Rajasthan have adopted the gum
tapping technique of CAZRI in large scale.
Indian Council of Agricultural Research
(ICAR) launched a Network Project on
“Harvesting, Processing and Value Addition of
Natural Resins and Gums” at CAZRI, Jodhpur
in 2008, which provided financial support for
R & D and extension activities of technologies
for resins and gums. Under the network
project, field demonstrations of the technique
were done at different villages of Barmer,
Jodhpur, Nagaur, Pali and Jalore districts of
hot arid western Rajasthan, which resulted in
large scale adoption of the technique by gum
Arabic tappers. For examples, the majority of
farmers of Chauhatan and Baytu tehsils of
Barmer district; Shergarh and Phalodi tehsils of Jodhpur; and some villages of Nagaur, Pali and Jalore districts of western Rajasthan have adopted the gum exudation technique of CAZRI in large scale. In 2009, total 12,104 trees of *A. senegal* were treated with standard dose of CAZRI Gum Inducer, which resulted in production of 5.45 tons of gum Arabic. In 2010 and 2011, numbers of *A. senegal* trees treated with standard dose of CAZRI Gum Inducer reached to 20,950 and 22,610, respectively, which resulted in production of 10.48 and 7.67 tones of gum Arabic, respectively (Fig. 2). The average sale rate of gum Arabic in local markets of India has been found to be 10 US$ (Rs. 500) per kg of gum. In this way, with average rate of 10US$ per kg of gum, gum harvesters of the hot arid region of western Rajasthan earned gross income of 54.5, 104.8 and 76.6 thousand US$ during 2009, 2010 and 2011, respectively by sale of gum Arabic in local markets. In three year (2009-2011), total 23.59 tons of gum Arabic was produced and 235.9 thousand US$ was earned as gross income by gum tappers of said areas through use of CAZRI Gum Inducer and gum exudation technology. Fig. 3 shows some photographs of gum Arabic collection by gum tappers of Baytu and Chauhatan tehsils of Barmer district of Rajasthan. The effort of CAZRI has changed the scenario of livelihood options in gum belt regions of western Rajasthan and the same may happen in other parts of gum belt region of the world in hot arid climate if the technique is adopted.

Fig. 2. Total number of *Acacia senegal* trees (thousands) treated with standard dose of CAZRI Gum Inducer, total production of gum Arabic (tons) and total income (thousand US$) earned by gum tappers of western Rajasthan.

Fig. 3. Gum Arabic production by gum tappers of western Rajasthan using CAZRI gum tapping technique. Photographs are from some rural households of Chauhan and Baytu tehsils of Barmer district of Rajasthan. Photograph second from left in lower line is of a village shopkeeper, who has purchased the gum from the gum tappers.
Conclusion

The species, *Acacia senegal* can be source of income for millions of the people of arid and semi-arid tropics, if it is explored scientifically for gum tapping. In drought like situations, when crops are total failure and farmers have no other means to survive, *Acacia senegal* can provide a good source of income by way of gum production. CAZRI gum tapping technique has worldwide importance as it compliments very well for employment and income generation in drought prone hot arid & semi-arid climatic areas. The technology has potential to change the scenario of income and service provided by gum yielding trees in arid land farming systems. However, there is urgent need to employ the technology in sustanaible manner so that there is no harm to the tree for long term production.