



# **Gums and Resins: General Overview**

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## 1.0 Introduction

- ❖ Plant gums and resins are commodities produced from various sources of plants including sea weeds
- ❖ In Africa several of these commodities have been commercialized for several millenia and remain so to the present day
- ❖ Focus for the presentation will be on the general description of the **Gums and Resins**, botanical sources (including occurrence and distribution) and physical and chemical characteristics



## 2.0 Plant gums - general description

- ❖ Plant gums - adhesive like substance of vegetable origin, mostly obtained as exudates from the bark of trees or shrubs
- ❖ Produced naturally (exudation) or through tapping. Process of production - gummosis (mechanism to heal the wound)
- ❖ Colour and shape are variable and depend on the botanical source but generally lumps, usually clear to dark brown





## 2.1 Plant gums - Botanical sources

- i) Gum arabic - produced from *S. senegal* or *V. seyal*.
- ❖ *S. senegal* - main source of GA and most widespread in the Sahel & E<sup>n</sup> Africa. Has four varieties
    - *var senegal* - most widespread in the Sahel & E<sup>n</sup> Africa
    - *var. kerensis* – 2<sup>nd</sup> source of GA, Eastern Africa - Southern Ethiopia, Somalia, Kenya and Tanzania
    - *var. leiorachis* - discontinuous range, Horn of Africa and Southern Africa
    - *var. rostrata* - across southern Africa, south of the Zambezi river





## Plant gums - Botanical sources

### ❖ *V. seyal* - two varieties

- *Var. seyal* – more widespread in the sahel and Eastern Africa
- *Var. fistula* – Eastern Africa and Central Africa





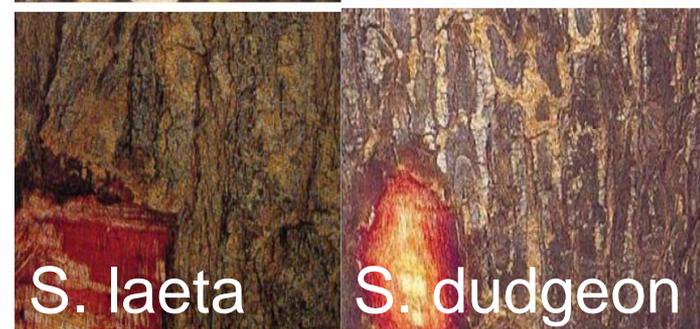
# Plant gums - Botanical sources

## ii) Commercial gums sold as GA

- *S. laeta* and *S. dudgeoni* – Central & West Africa
- *S. polyacantha* – Sahel and Eastern Africa

## iii) Other species producing gum in commercial quantities

- ❖ *Sterculia setigera* – gum karaya, West Africa to Sudan
- ❖ *V. drepanolobium* and *V. paoli* – Eastern Africa
- ❖ Combretum species – *C. nigricans* – Central & West African Sahel
- ❖ Albizzia species – West Africa



*S. laeta*

*S. dudgeon*



## 2.2 Plant gums - chemical characteristics

- ❖ Plant gums - hydrocolloid polymers of high molecular weight polysaccharides
  - **Polysaccharides** - building blocks of various simple sugars
    - ✓ gum arabic - D-galactose, D-glucuronic acid, L-rhamnose and L-arabinose; protein ~ 2%; Arabino-galactan protein
    - ✓ **gum karaya** - acetylated polysaccharide; 37% D-galacturonic acid and about 8% acetyl groups by weight; D-galactose, L-rhamnose
    - ✓ Some water soluble (gum arabic) others mucilage (gum karaya)
  - rich in various minerals ~ 14 cations (Ca, K, Na & Mg most abundant)
  - Specifications exist for gum arabic and gum karaya based on MC, optical rotation, N hence protein and viscosity
  - Above influence application in food, pharmaceutical & technical applications



## 2.2 Plant resins - general description

- ❖ **Plants resins** - exudates from the bark of the trees, which harden on exposure to air - brittle, amorphous and transparent or semi-transparent nodules/tears
- ❖ **Types** - gum-resins and oleoresins
  - Gum-resins - mixture of both gums, resins and essential oils
  - Oleoresins - resins and essential oils; several pines species (*P. caribaea*, *P. oocarpa*, *P. radiata*, *P. elliotti*)
- ❖ Gum-resins - natural exudation and tapping
- ❖ Oleoresins - tapping





# Plant resins - Botanical sources

- ❖ Buseracea family - Commiphora & Boswellia
- ❖ *Commiphora myrrha*, the source of true myrrh; Eastern Africa – S<sup>n</sup> Ethiopia, Somalia and Kenya
- ❖ *Commiphora holtizziana* the source of medicinal type of opoponax commonly known as hagar; Eastern Africa S<sup>n</sup> Ethiopia, Somalia and Kenya
- ❖ *C. Molmol* source of scented type of opoponax, Eastern Africa S<sup>n</sup> Ethiopia and Somalia
- ❖ *Boswellia neglecta* main source of frankincense commercially known as olibanum. Eastern Africa S<sup>n</sup> Ethiopia, Somalia, Kenya, TZ and UG
- ❖ *Boswellia dalzielii* Sahel though not fully commercialised
- ❖ *B. frereana* and *B. sacra* Northern Somalia (Somaliland and Puntland)
- ❖ *B. papyrifera* – Djibouti, Eritrea, Ethiopia & Sudan



*C. myrrha*



*C. holtizziana*



*B. neglecta*



## Plant resins - Physical and chemical characteristics

- ❖ **Gum-resins** - pale to reddish brown tears (frankincense); brown to dark brown (myrrh and opoponax)
- ❖ Fragrant aroma due to presence of essential oils with myrrh more pungent
- ❖ Insoluble in water but soluble in organic solvents
- ❖ Gum-resins - essential oil, alcohol soluble resin and water soluble gum
  - Myrrh - 3-8% essential oil, 25-40% resin and 30-40% gum
  - Frankincense - 5-9% essential oil, 65-85% resin and 8-30% gum
  - Opoponax more essential oil and resin than myrrh
- ❖ Essential oils - mono-, sesqui- and diterpenoids; determine fragrance and flavour uses
- ❖ Resins - triterpenoids
- ❖ Processed - steam distillation (essential oil), solvent extraction (resinoid) used or further fractionation for various industrial applications



## Some questions to consider for discussion

- ❖ The focus was on indigenous plant gums and resins found in Africa, specifically SSA
  - identify other gum and resin commodities in your country and/or sub-region with potential for commercialization
  - What is the status or production and utilization?
  - What are the gaps and challenges, if any, affecting commercialization?