

Cyanophore Glycosides

- Several glycosides yields on hydrolysis **hydrocyanic acid** as one of the products of hydrolysis and **sugar** specially in the family **Rosaceae**.
- They are sometimes designated as cyanogenetic glycosides, but since they only liberate cyanogen compounds when hydrolyzed, the term **cyanophore** seems to indicate their properties more correctly.
- As a class, drugs containing cyanophore glycosides do not have wide application in pharmacy or medicines.
- They are very dangerous because of the highly poisonous properties of hydrocyanic acid (**prussic acid, HCN**) and may cause live stock poisoning resulting from eating the vegetative parts of plants containing them.

- It is estimated that 1-2 mg/kg is a fatal oral dose of cyanide for a 70-kg man. For example one would need to finely chew and eat about 200 **apple** seeds, or about 20 apple cores, to receive a fatal dose.

❖ Symptoms that occur within minutes with small amounts:

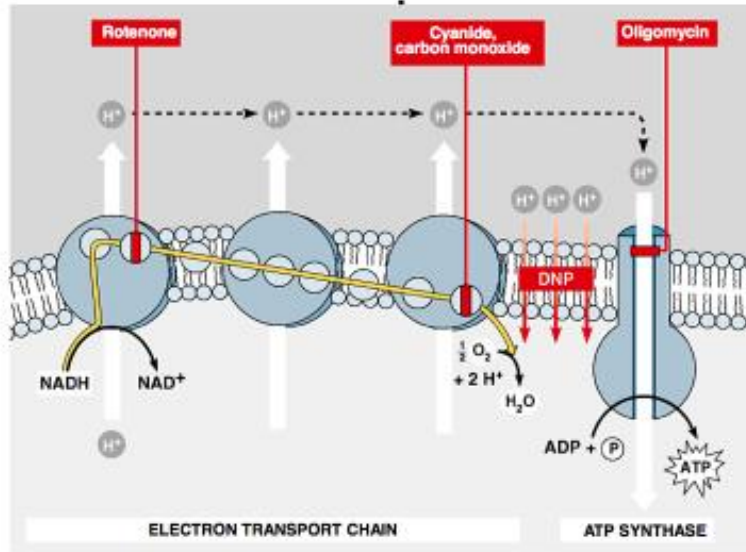
Rapid breathing – weakness – nausea and vomiting – restlessness – headache – rapid heart rate – dizziness دوخة.

❖ With larger doses:

Convulsions – loss of consciousness – low blood pressure – lung injury – slow heart rate – respiratory failure leading to death.

Mechanism of toxicity:

- It produces hypoxia by binding to the ferric ion especially the one present in cytochrome oxidase system.
- Consequently, the enzyme complex electron transport is inhibited where ATP production is inhibited as a result of hypoxia.



Cytochrome oxidase will ultimately make it possible for protons entry inside the cell to be later utilized to produce ATP

العنبيوت أو الكاسافا مصدر غني للكربوهيدرات
 السورغم - الفرة البلدية (المكائن) - علف للمواشي
 الكتان
 الفاصولياء البيضاء
 النوكاسيا اذن الفيل
 خيزران

Food	Major cyanogenic glycoside present
Cassava (<i>Manihot esculenta</i>) - root	Linamarin
Sorghum (<i>Sorghum vulgare</i>) - leaves	Dhurrin
Flax (<i>Linum usitatissimum</i>) - seed meal Leaves and roots	Linamarin, linustatin, neolinustatin
Lima beans (<i>Phaseolus lunatus</i>)	
Giant taro (<i>Alocasia macrorrhizos</i>) - leaves	Triglochinin
Bamboo (<i>Bambusa arundinacea</i>) - young shoots	Taxiphyllin
Apple (<i>Malus spp.</i>) - Seed	Amygdalin
Peach (<i>Prunus persica</i>) - Kernel لراق	Amygdalin
Apricot (<i>Prunus armeniace</i>) - Kernel نواة	Amygdalin
Plum (<i>Prunus spp.</i>) - Kernel	Amygdalin
Nectarine (<i>Prunus persica var nucipersica</i>) - Kernel	Amygdalin
Cherry (<i>Prunus spp.</i>)	Amygdalin
Bitter almond (<i>Prunus dulcis</i>)	Amygdalin



Giant Taro



Lima beans
الفاصولياء البيضاء



Bamboo
shoots





Linseeds



yr



Cassava



Sorghum

- HCN acid does not occur as such in plants, but, in the form of glycoside which may evolve through enzymatic hydrolysis.
- The best known drugs derived from such glycosides are **volatile oils of bitter almond and wild cherry**, both are oils used as **sedatives**, specially in various **cough syrups** and similar preparations.

Wild cherry



17

1. Amygdalin: this glycoside is found in **bitter almond** in the kernels (nuclei) of fruits like **apricot, cherries, peaches** دراق , **plums** البرقوق أو الخوخ (Family: Rosaceae).



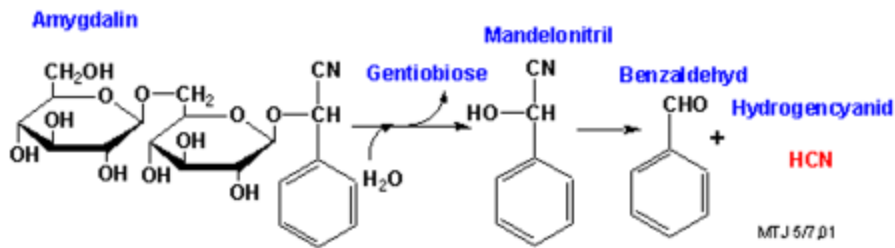
Peaches

Plums

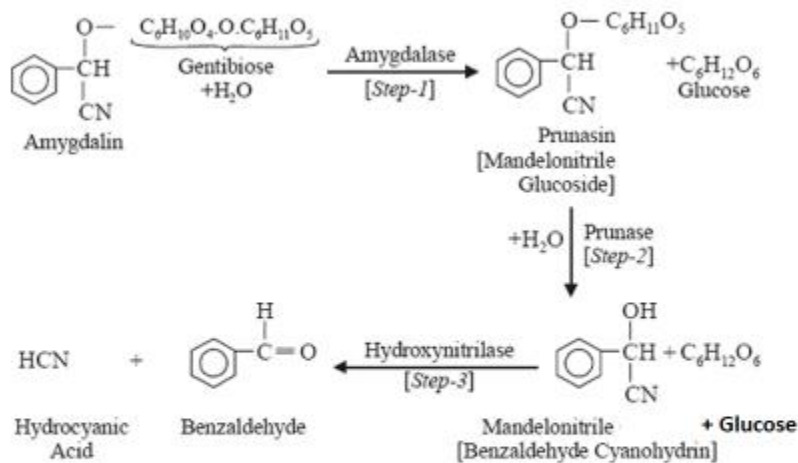
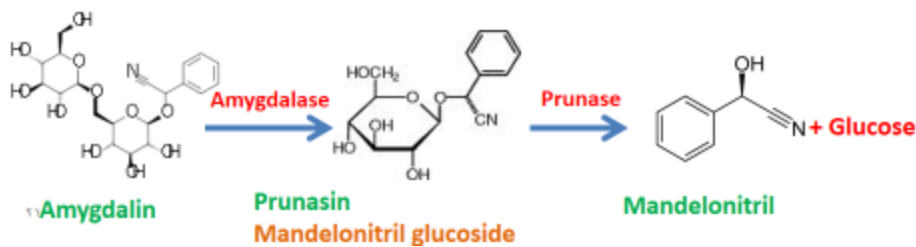


18

Gentiobiose is a disaccharide composed of two units of D-glucose

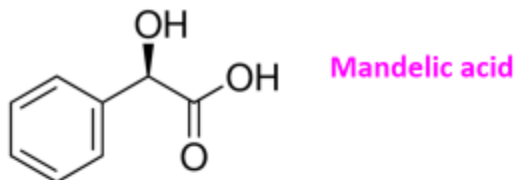


- The enzyme **emulsin**, obtained from almond kernals, consists of a mixture of 2 enzymes, **amygdalase** for the first step and **prunase** for the second step.



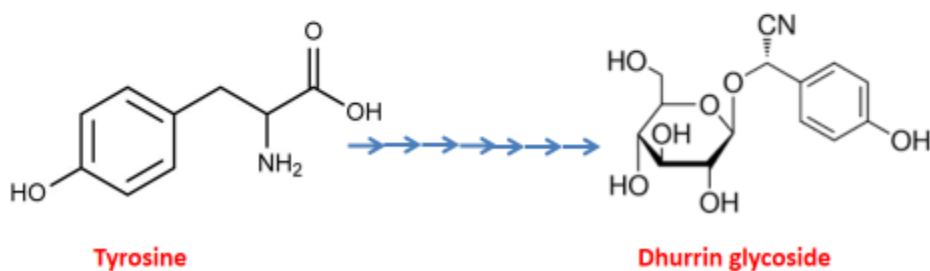
Hydrolysis of amygdalin

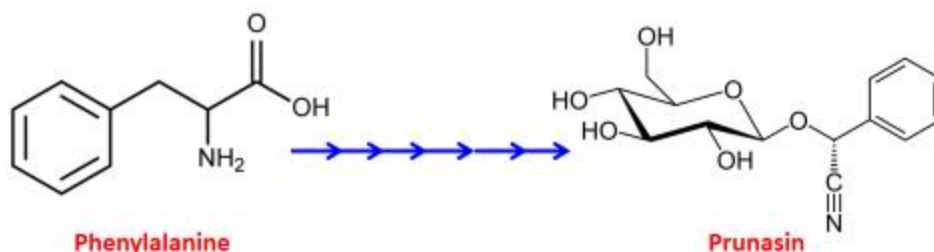
- Since one of the products is **benzaldehyde**, thus **amygdalin containing drugs are classified with aldehyde glycoside group**.
- The group of cyanophore glycosides are represented by **amygdalin** which is found in large quantities in **bitter almond**, and also by **prunasin** which is found in *Prunus padus* (Bird cherry, **خوخ بادي**).



Biosynthesis:

The biosynthesis of cyanophore glycosides has been proven to be from shikimic acid pathway.





Drugs containing Cyanophore Glycosides:

1. Wild Cherry: dried stem bark of *Prunus serotina* كرز أسود (F. Rosaceae). Wild cherry is known as *Prunus virginiana* كرز الطيور or *Prunus serotina*.

- The plant is indigenous to USA and Canada.
- The plant was used by the red Indians as a domestic medicine and it contains: **D-mandelonitrile glucoside (prunasin)** also it contains **amulsin**, **β-methyl aesculetin** (methylether of dihydroxy coumarin).

- Also it contains **L-mandelic acid** and **p-coumaric acid**, **trimethylgallic acid**.
- The HCN acid liberated from this plant is between 0.23 - 0.32% from the inner bark and 0.03% from the outer bark.

Uses: most important uses as **syrup**, **flavoring agent**, **sedative expectorant**.

- The D-mandelonitrile in this plant is an isomer to the **L-mandelonitrile** which is found in:

2. Sambucus nigra: (الخمّان الأسود هو نوع نباتي ينتمي إلى جنس الخمّان (من الفصيلة المسكية).

- It which contains **L-mandelonitrile** glucoside in the leaves as **sambunigrin**.

3. Prunus laurocerasus (leaves): which contains **D and L-mandelonitrile glucoside** in the leaves of the plant which is known as **prulaurasin**.