

Ministry education and Science of Republic of Kazakhstan  
Karaganda State University named after academician Ye.A.  
Buketov

Biological and geographical faculty

Botany Department

Course – Botany  
Specialty - 5B011300 – «Biology»

Lecture № 3

## **Root and root systems. Metamorphosis of roots. Anatomical structure of root**

(1 hour)

Lecturer: candidate of biological science, associated professor  
Ishmuratova Margarita Yulaevna



# **Plan of lecture:**

- 1 Type of root systems. Morphology of root.
- 2 Anatomical structure of root.
- 3 Metamorphosis of root.

## **Main literatures:**

- 1 Бавтуто Г.А. Практикум по анатомии и морфологии растений. – Минск: Новое знание, 2002. – 185 с.
- 2 Родман А.С. Ботаника. – М.: Колос, 2001. - 328 с.

## **Additional literatures:**

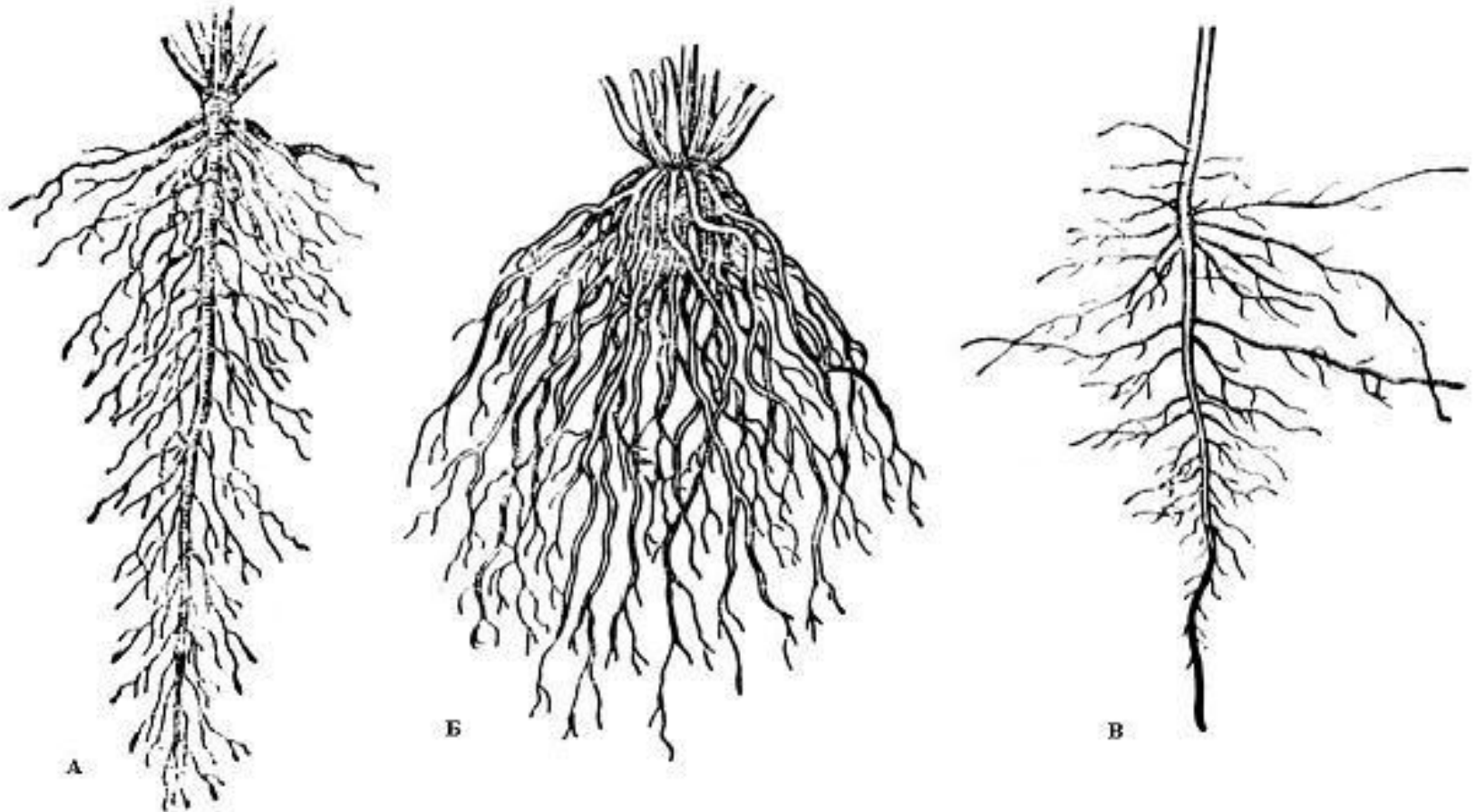
- 1 Ишмуратова М.Ю. Ботаника. Учебно-методическое пособие. - Караганда: РИО Болашак-Баспа, 2015. - 331 с.
- 2 Тусупбекова Г.Т. Основы естествознания. Ч. 1. Ботаника. – Астана: Фолиант, 2013. – 321 с.
- 3 Байтулин И.О. Основы ризологии. - Алматы: Гылым, 2001. – 210 с.

**The root** – is a vegetative organ of plant, conducted in typical case the function of soil nutrition. Root is a organ with redial symmetry and capable for non-final growth by apical meristem. Root is differ from stalk because it does not create leaves, and apical meristem is covered by pileorhiza.

### **Functions of root:**

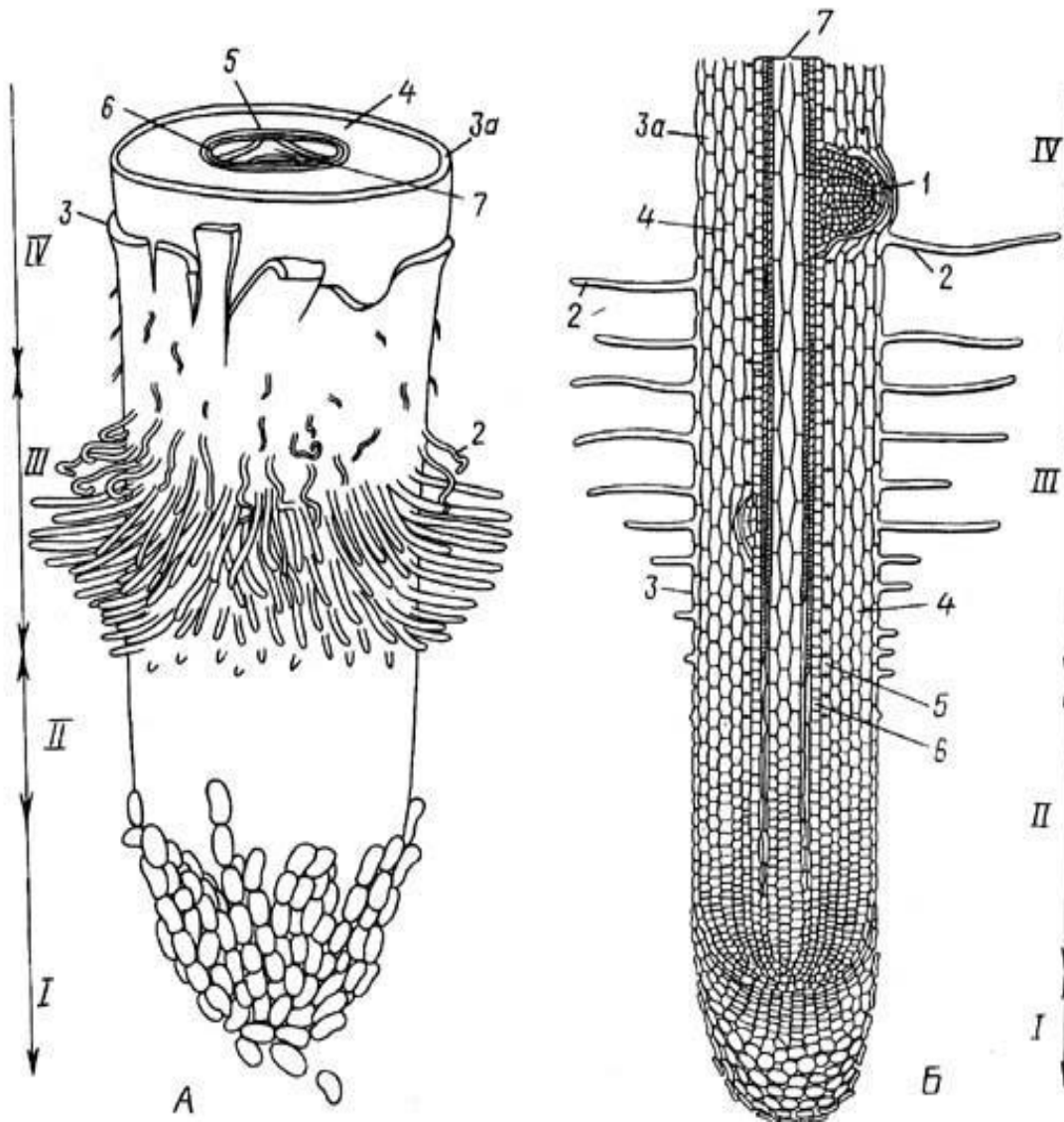
- 1) Roots make vertical base for growth of plants;
- 2) Roots are synthesized different compounds which after transport in other organs of plants;
- 3) In root can be storage some nutrition compounds;
- 4) Roots communicate with root of other plants, microorganisms, mushrooms, located in soil.

# Type of root systems of plants



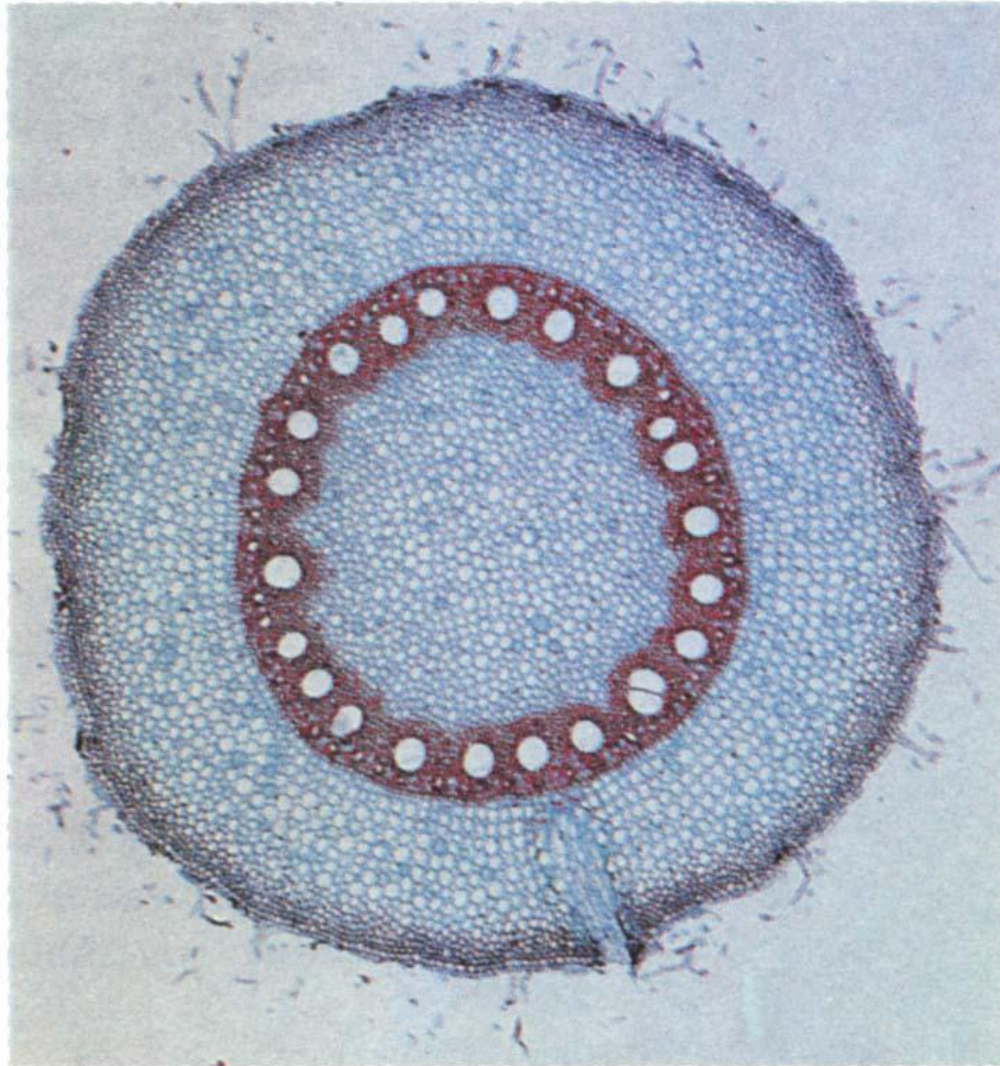
A – system of main root; Б – system of additional roots; B – separated root systems (A and B – taproot systems; Б – fibrillous root system)

# General view (A) and lateral cut (Б) of root end



I – pileorhiza; II – zone of duplication and growing; III – zone of intake; IV – beginning of transport zone: 1 – growing lateral root; 2 – root hair; 3 – rhizodermis; 3a – exodermis; 4 – primary bark; 5 – endodermis; 6 – pericycle; 7 – central cylinder

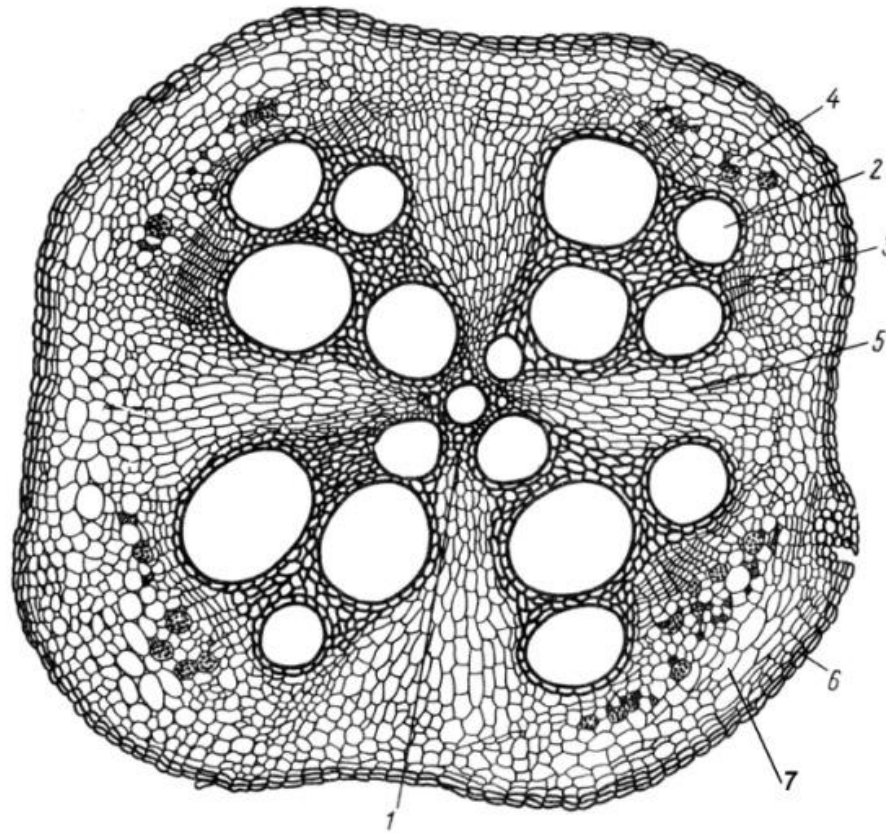
# Cross cut of root of corn



500  $\mu\text{m}$



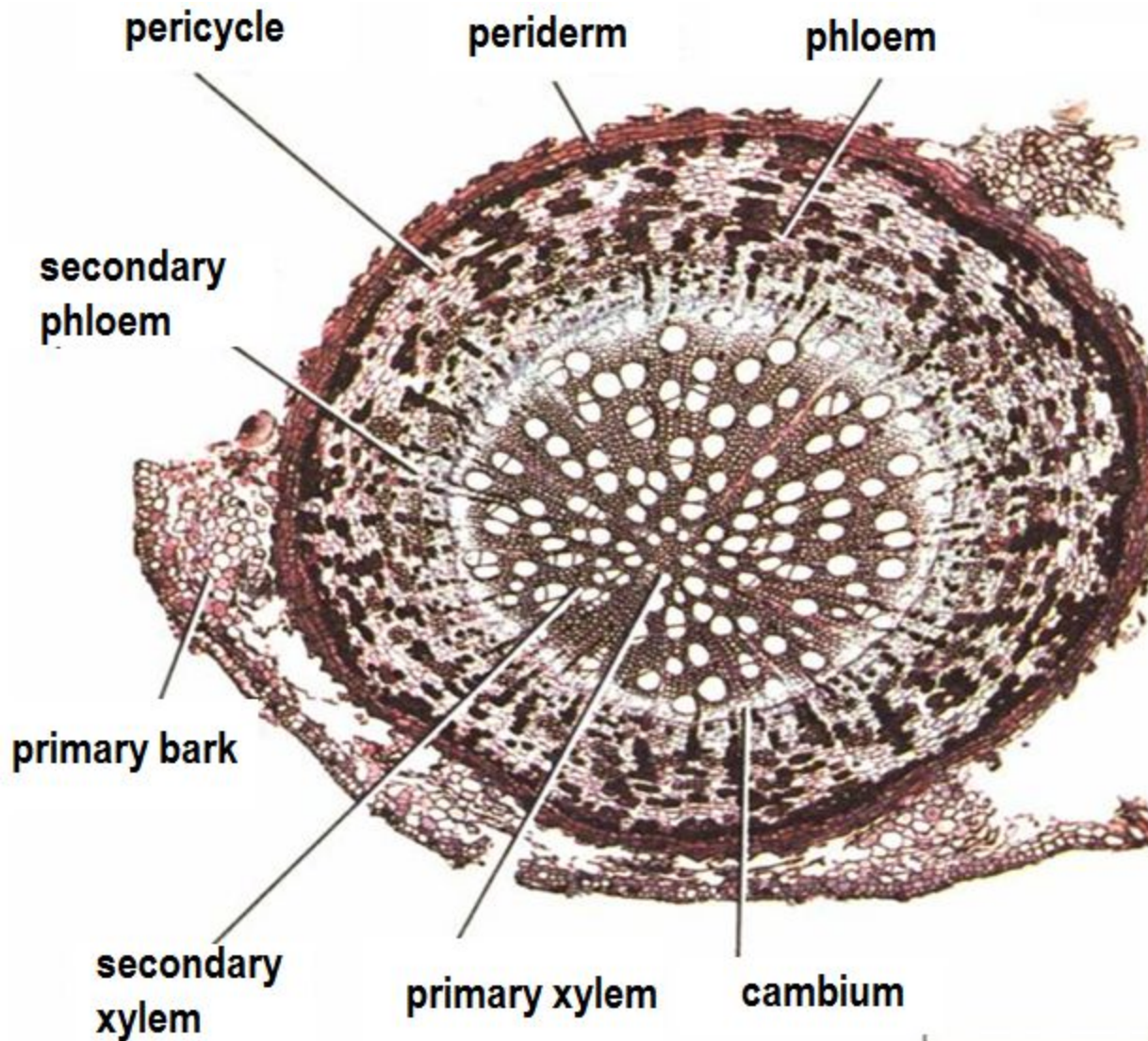
# Cross cut of root of pumpkin



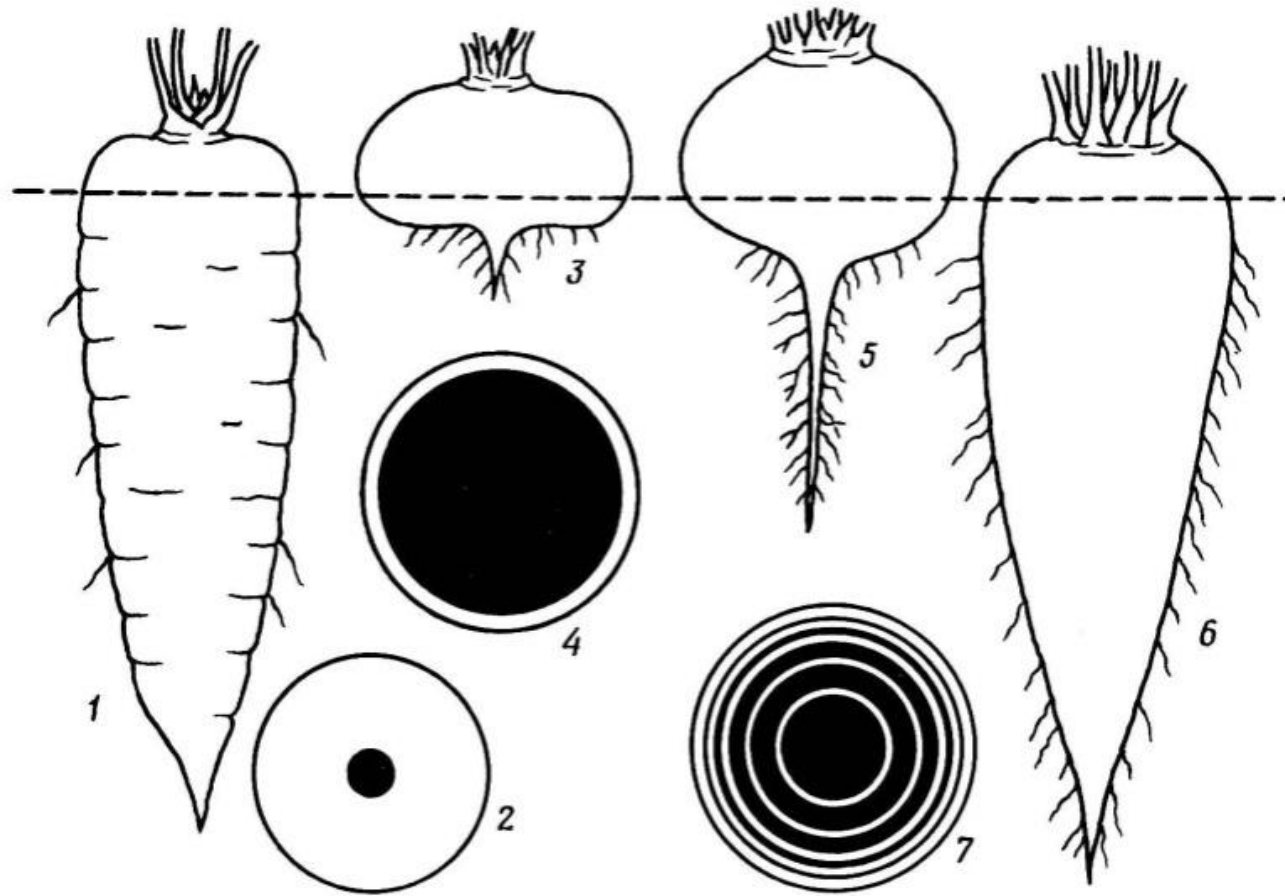
1 – primary xylem; 2 – secondary xylem; 3 – cambium; 4 – secondary phloem; 5 – primary vascular ray; 6 – cork; 7 – parenchyma of secondary bark



# Cross cut of root of *Salix* in the end of the first vegetative period

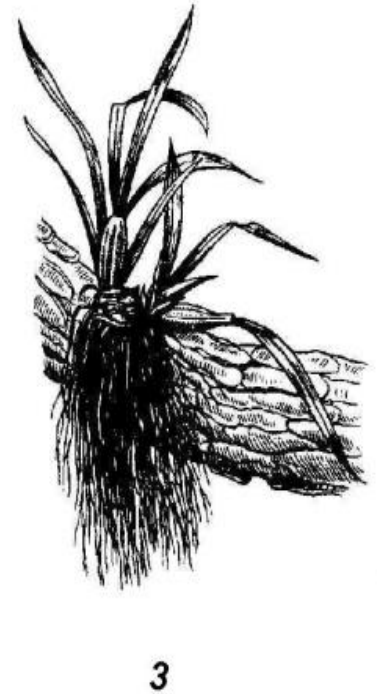
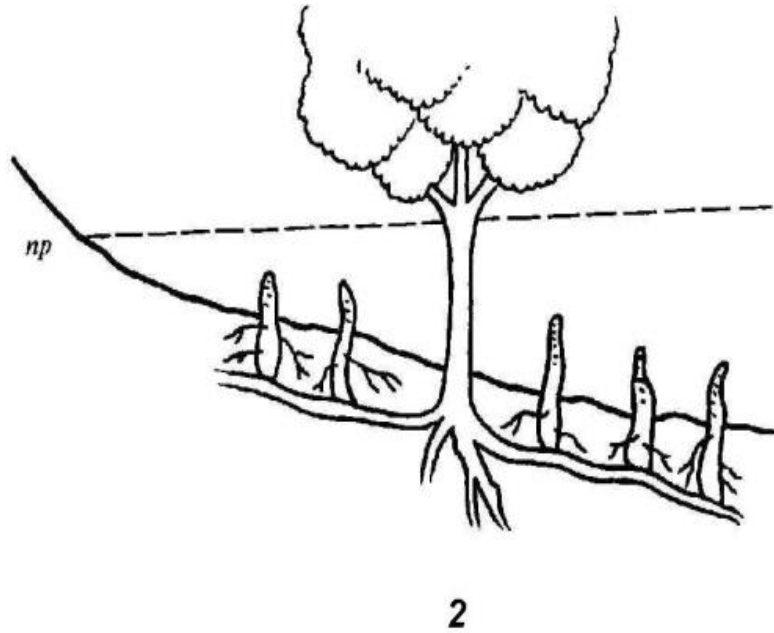
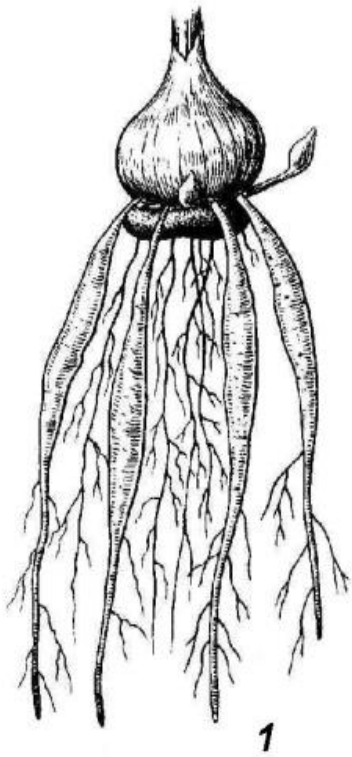


# Root crop of carrot (1, 2), turnip (3, 4) and beet (5, 6, 7)



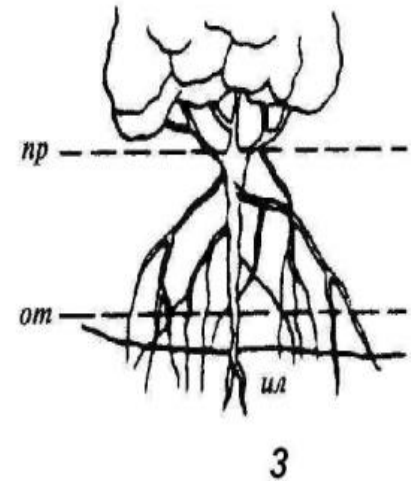
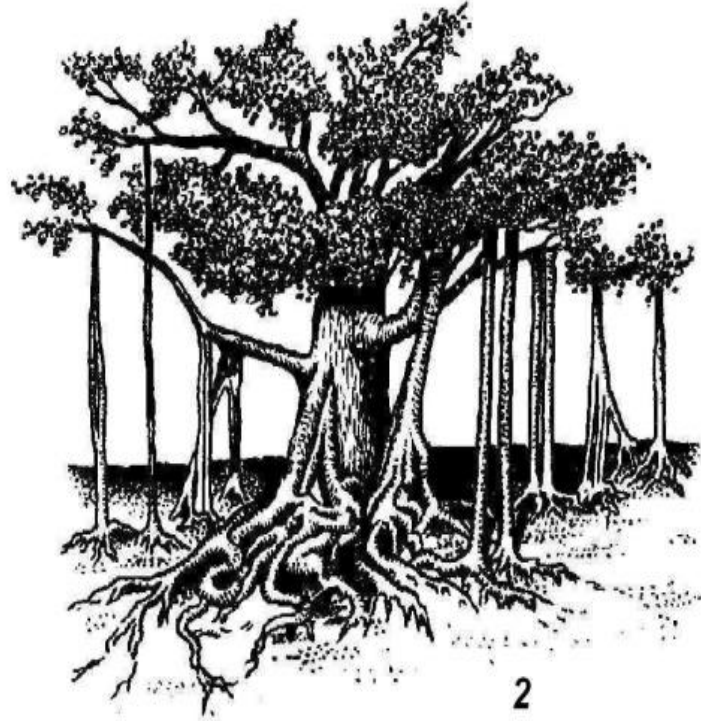
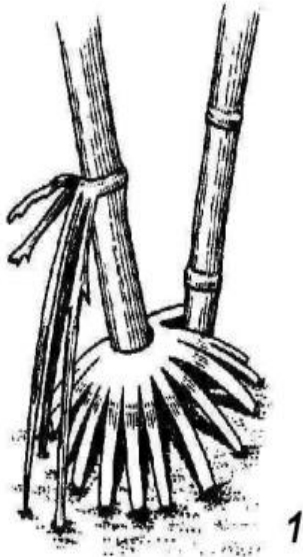
(on the cross cut the xylem marked by black color;  
horizontal line – a border between stalk and root)

# Metamorphosis of roots



1 – bulbotuber of gladiolus with contractile roots; 2 – breathing roots with pneumatophores of avicenia (*np* – zone of tide); 3 – air root of orchids

# Metamorphosis of roots



1 – walking roots of corn; 2 – root of banyan; 3 – walking root of rhizophore (*np* – zone of tide; *om* – zone of low tide; *ua* – cover of mud bottom)

## **Control questions:**

- 1 What are the main and additional functions of roots?
- 2 Which root systems are characterized for monocotyledons and dicotyledonous plants?
- 3 Which additional function act the roots in processes of metamorphoses?
- 4 Describe the functions of air and contractile roots.
- 5 How do roots create symbiosis with bacteria?
- 6 Which type of roots have storage function?

## **Test questions:**

**From per cycle in root of dicotyledonous plant is created:**

- A) main root
- B) air roots
- C) additional roots
- Д) xylem
- E) phloem

**Tissues which transferee only organic compounds:**

- A) mechanic tissues
- B) phloem
- C) basic parenchyma
- Д) sclerenchyma
- E) collenchymas