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R. H. Yapp
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CHAPTER I

THE GROUNDSEL, THE SYCAMORE AND THE COCK'S-FOOT GRASS

Plants of very many kinds are found all over the world. Some live on land, others in the water. Some are only to be found in woods, while others grow on the seashore, or even in dry, stony deserts. There are indeed very few places on the surface of the globe where plants of some kind or other are not to be found. Let us take a few of these plants and find out as much as we can about them.

The Groundsel, a very familiar weed, will do to start with. It is to be found in almost every garden, but you will look for it in vain in such places as a grassy meadow, an Oak wood, or in the water.

Look at a Groundsel plant as it grows in a garden. The green part above the soil is called the **shoot**; it consists of an upright, rather juicy **stem**, and a number of flat **leaves** (Fig. 1). Towards the upper end of the stem you may find some yellowish **flowers**, or even a cluster of small **fruits**, each with a tuft of hairs. If you dig up the plant and shake it free from soil, the whitish underground parts, or **roots**, will be seen.

Now examine the plant a little more carefully.

1. **The shoot.** The **main stem** is rounded, especially at its lower end. Higher up it is ridged, and has an angular appearance. The parts where the leaves are joined to the stem are called **nodes**, the smooth parts between the nodes being the **internodes**. In the Groundsel there is only one leaf at each node, and the leaves are arranged round the stem in a spiral. If we look at a plant first from the side and then from above (Figs. 1, 2), we see that this arrangement makes it easy for every leaf to get light and air. Later on we shall learn that this is of the greatest importance.

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In the lower leaves we can distinguish three parts: (a) the flat, thin **leaf-blade**, the edge of which is irregularly toothed;

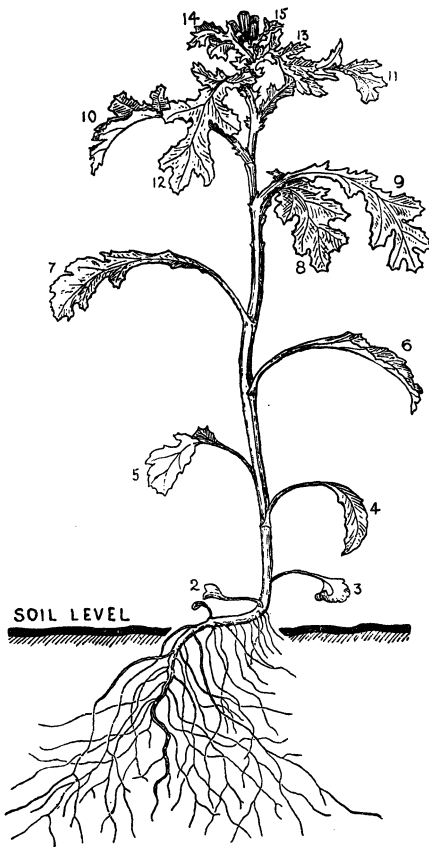


Fig. 1. GROUNDSEL PLANT. Leaves numbered according to age, the oldest below, the youngest above. (August, $\times 1/2$.)

(b) the narrow **leaf-stalk** or **petiole**, and (c) the slightly broader **leaf-base**, by which the leaf is joined to the stem. The leaves

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Groundsel

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of the Groundsel vary both in size and shape, even on the same plant (Fig. 3). The upper leaves, unlike the lower, usually have

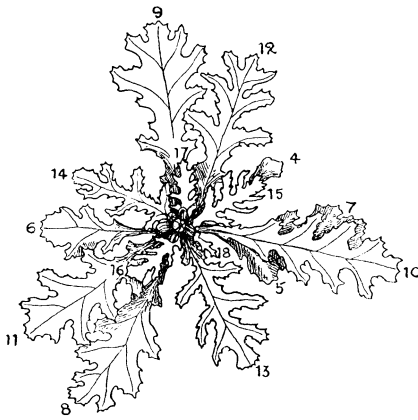


Fig. 2. GROUNDSEL SHOOT SEEN FROM ABOVE. ($\times 1/2$.)

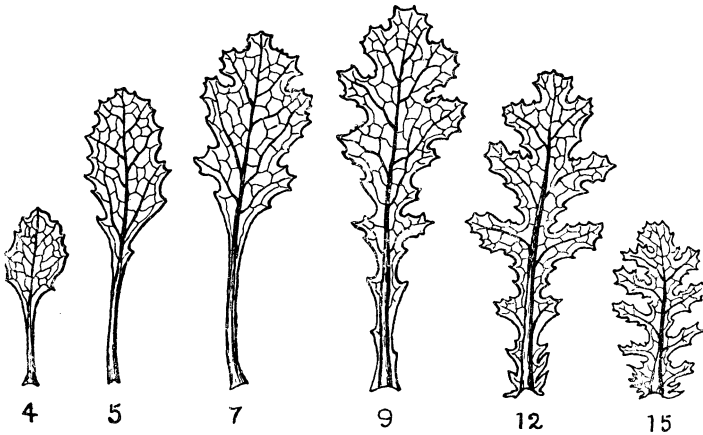


Fig. 3. GROUNDSEL: DIFFERENT SHAPES OF LEAVES ON THE SAME PLANT. Numbered as in Fig. 1. ($\times 3/4$.)

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no petioles; their blades are also more deeply toothed or lobed, and often clasp the stem (Fig. 4). Each leaf has an **upper surface** turned towards the sky, and a **lower surface**, of a lighter green colour, turned towards the ground. The **midrib** or **main vein** of the leaf is marked by a projecting ridge on the lower surface of the leaf-blade, and by a shallow groove on the upper. If the leaf is held up to the light and examined with a pocket lens, other veins are seen forming a network in the leaf-blade (Fig. 3).

Buds. On gently bending down a leaf, we find a small, hairy **bud** just above the leaf-base, and between it and the stem (Fig. 4)

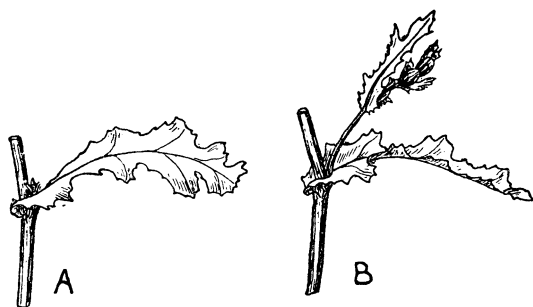


Fig. 4. GROUNDSEL. A, a node with leaf and axillary bud. B, axillary bud grown into a branch shoot. (Aug. $\times 3/4$.)

The angle between the leaf and the internode above it is called the **axil** of the leaf, so the bud is said to be an **axillary bud**. Later on this bud may grow and become a **branch** or **lateral shoot**, which consists of stem and leaves, just like the main shoot (Fig. 4). Usually there is a bud in the axil of every leaf, but only some of these buds grow into branches. Branches can only arise in the axils of leaves.

2. **The root-system.** The **main root** (Fig. 1) is continuous with the main stem of the plant. It grows downwards into the soil, while the main stem grows upwards away from it. The **secondary** or **lateral roots** are branches of the main root.

They spread outwards from the main root, growing between the particles of soil. The secondary roots give rise to still smaller **rootlets** (Fig. 1). The roots of the Groundsel branch a great deal, but they only form other roots, and never produce leaves, buds or flowers. By means of its roots the plant is anchored to the spot where it is going to spend the rest of its life.

The Groundsel plant then consists of a number of different parts or **organs**. We shall see later that each of these organs has some special work to do. The plant usually grows quickly, and dies after producing flowers and fruits. Several generations of plants may be produced in a single season, so that we can find the Groundsel at almost any time of the year. The Groundsel does not live for more than one year, and therefore is said to be an **annual**.

The Sycamore Tree. We may next examine the Sycamore tree. At first sight such a big plant (Fig. 5) seems altogether different from the humble Groundsel, but even the tallest tree was small once, so if we start with a young Sycamore we can more easily compare it with the Groundsel. The plant shown in Fig. 6 is about a year and a half old. We see at once that there is a branching root-system, firmly fixed in the soil. Like those of the Groundsel, the roots of the Sycamore produce neither leaves nor buds, nor are they green in colour. Above the ground is the shoot, with an upright stem, stronger than that of the Groundsel, but divided into nodes and internodes in the same way. Notice that in the Sycamore there are two leaves instead of one at each node. The leaves are different in shape from those of the Groundsel, but resemble them in having flat, green leaf-blades and axillary buds. The petiole is very distinct from the leaf-blade and is joined to the stem by the leaf-base.

The midrib and other veins branch again and again, forming a beautiful and delicate network in every part of the leaf-blade. Many of the smallest branches end as little free tips within the meshes of the network (Fig. 7).

The Groundsel is an annual, but the Sycamore lives for a great many years, and is therefore called a **perennial**. Each year the roots increase in size, and become more and more numerous. The main stem, too, becomes very tall and thick, forming the woody **trunk** of the tree (Fig. 5). Every year some of the buds grow into new branches, so that an old tree may have hundreds of

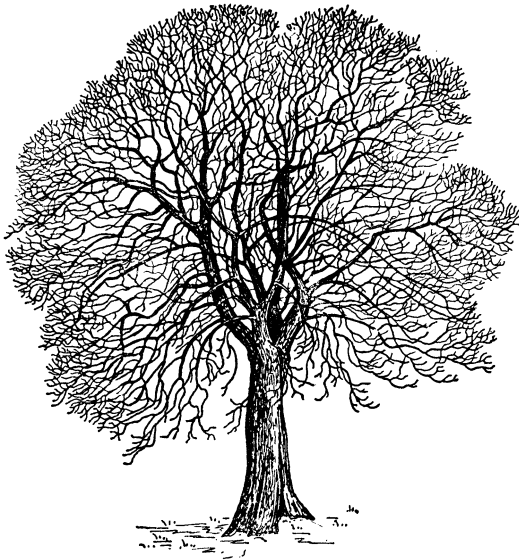


Fig. 5. SYCAMORE IN WINTER CONDITION. (March.)

branches of all sizes. The smallest branches are known as twigs. All these branches, even the largest ones, began life as little buds in the axils of leaves. In the Sycamore, as well as in the Groundsel, branches only arise in the axils of leaves.

Appearance at different seasons of the year. During the summer every small twig carries several pairs of leaves, so that the whole tree is covered with green foliage. In the autumn,

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The Sycamore Tree

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however, the leaves become yellow and finally fall off, leaving smooth **leaf-scars** on the twigs. In the axils of these leaf-scars we can still see the buds, which remain behind when the leaves fall (Fig. 96). At the tip of each twig is a **terminal bud**, which did not arise in the axil of a leaf. Thus buds may be either terminal or axillary in position. All the buds are covered

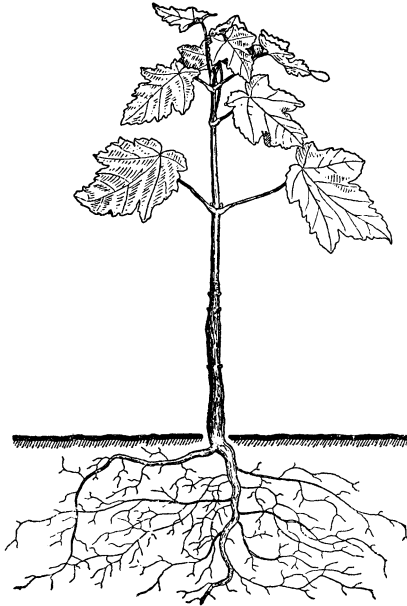


Fig. 6. YOUNG SYCAMORE. (Aug. $\times 1/4$.)

with small, overlapping **bud-scales** (Fig. 88). The tree does not grow during the winter-time, but remains in the bare, resting condition which is so familiar to us (Fig. 5). In the early spring, however, about March or April, growth begins again. The numerous terminal buds, and some of the axillary ones, swell, becoming longer and longer, as the bud-scales and the delicate

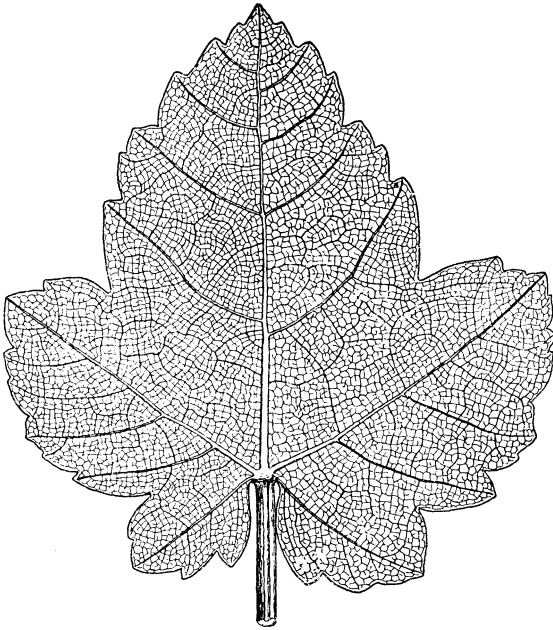


Fig. 7. VERY SMALL SYCAMORE LEAF. (Aug. $\times 2$.)

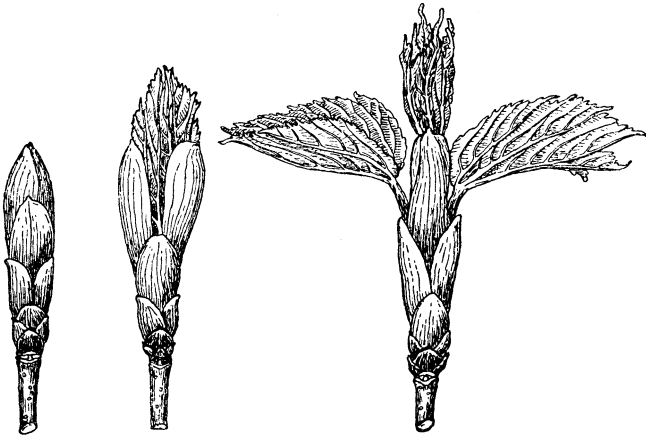


Fig. 8. OPENING BUDS OF SYCAMORE. (May, $\times 5/8$.)

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The Sycamore Tree

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parts inside begin to grow. Soon the buds burst, and the small folded leaves appear (Fig. 8). In a surprisingly short time the whole tree is once more covered with leaves. One reason why this happens so quickly is that the leaves were really formed during the previous summer. They have rested during the winter inside the buds, and when spring comes all they have to do is to burst the buds and grow to their full size.

The Cock's-Foot Grass may be taken as a third example. This is a rather large grass, commonly found in pastures and waste places and on railway banks, where it often forms coarse, rough tussocks. If we look at one of these tussocks, we find it is made up of a great many green shoots. Unlike the Groundsel and the Sycamore, however, this plant does not appear to have any main stem. Also, if we dig up the plant, we find many branching roots in the soil, but no main root.

Let us carefully examine one or two of the shoots which make up a tussock (Fig. 9). Each shoot has a stem which, like those of the other two plants we have studied, is made up of nodes and internodes. One leaf is inserted at each node. The lower part of each stem usually takes up a creeping position, but the upper part is erect. In the lower part the leaves are crowded together, and the internodes are short, while the erect part bears fewer leaves, and the internodes are longer. In the summer-time flowers are formed at the top of the stem (Fig. 9).

The leaves are quite different in appearance from those of both the Groundsel and the Sycamore. Each leaf has a long, narrow leaf-blade, and a long leaf-base which forms a sheath right round the stem or the younger leaves (Figs. 9, 10). There is no petiole. Just where the leaf-blade joins the sheathing leaf-base, you will notice a curious papery structure which lies flat against the stem, or else against the sheath of the leaf above. This is called the **ligule** (Fig. 10). Its duty is to prevent rain from running down inside the sheath. Each leaf has a number of veins, which are parallel to each other (Fig. 10), and do not form a network as do

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those of the Groundsel and Sycamore. If you open a leaf sheath and carefully pull it down as far as it will go, you will find that

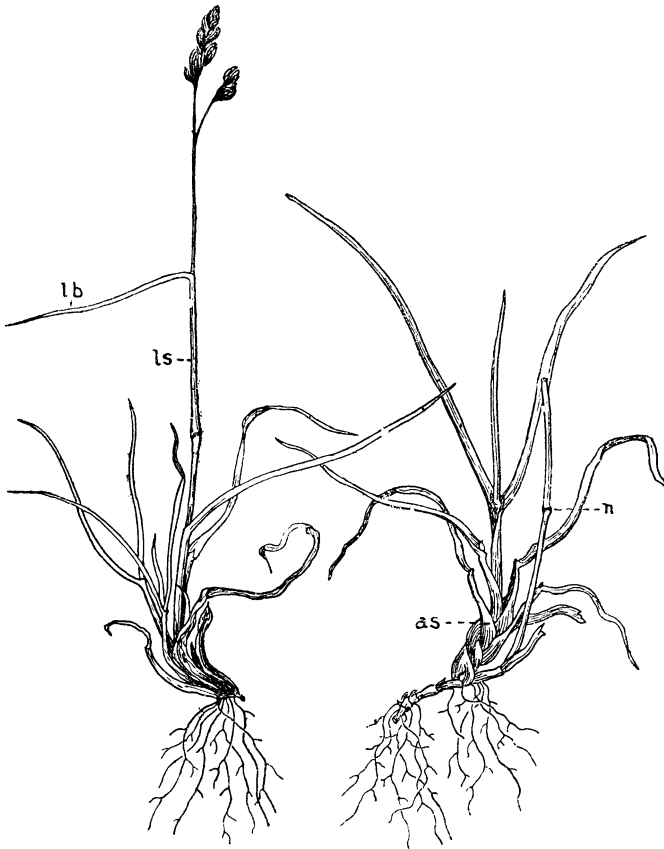


Fig. 9. Cock's-Foot GRASS. *as*, axillary shoot; *n*, node; *lb*, leaf-blade; *ls*, sheathing leaf-base. (Sept. $\times 1/5$.)

the node, where the leaf is actually joined to the stem, is some distance below the ligule. Notice the small, pointed bud in the