

Home Course In Modern Agriculture

I.—How a Seed Starts to Grow

By C. V. GREGORY,

Agricultural Division, Iowa State College
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A SEED is a simple thing to look at. It might as well be a pebble or a grain of sand for all you see. It is so small that you can hardly see it. It is so hard that you can hardly break it. It is so light that you can hardly feel it. It is so small that you can hardly see it. It is so hard that you can hardly break it. It is so light that you can hardly feel it.

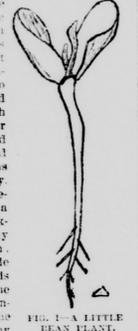


FIG. 1.—A LITTLE BEAN PLANT.

Now take a bean that has been soaked for a few hours. The seed will come apart easily. The part of the bean that is inside is found to be split in two. These two halves are called cotyledons, which is only another name for seed leaves.

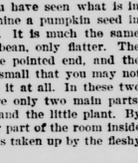


FIG. 2.—HOW A SQUASH PLANT TAKES OFF ITS SEED COAT.

Now let us look at a different kind of a seed. Take a kernel of corn that has been soaked for several hours and cut it in two lengthwise the narrow way. The back of the grain is made up in part of a hard, flinty substance and in part of a white, mealy layer. A hard part of the front of the kernel is taken up by the soft, oily germ.

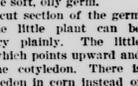


FIG. 3.—HOW A SQUASH PLANT TAKES OFF ITS SEED COAT.

We can help the soil to become warm in the spring, then, by doing all that we can to check evaporation. Did you ever notice how quickly the surface of a wet field became dry after it had been harrowed? This is because stirring and loosening the soil stops the water from coming up from below.

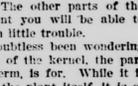


FIG. 4.—HOW A SQUASH PLANT TAKES OFF ITS SEED COAT.

There is one element, nitrogen, which forms a considerable part of the plant, that is harder to get. While three-fourths of the air is nitrogen, the soil does not seem to be able to change it into a soluble form. The only kind of plants that can use the nitrogen in the air at all are the legumes, such as clover and alfalfa.

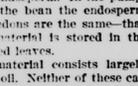


FIG. 5.—HOW A SQUASH PLANT TAKES OFF ITS SEED COAT.

Some of the potassium and phosphorus will not dissolve even when brought in contact with water. It takes a long contact with the air to cause chemical actions which will change it into a soluble form. Continual stirring of the soil hastens this change. Thorough stirring also loosens up the ground so that air can get down to the roots.

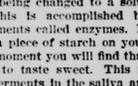


FIG. 6.—HOW A SQUASH PLANT TAKES OFF ITS SEED COAT.

The New Spanish Claim. Impossibilities to the mind is the motto of the treasure hunter, and there may prove to be life even in the Cuban colonial debt claim to furnish an international sensation for a time. It has been recently reported that further attempts would be made to fasten the responsibility upon the United States, although at the time of Spain's insistence that this country assume the obligation along with the sovereignty of the island came near breaking off the peace negotiations.

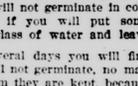


FIG. 7.—HOW A SQUASH PLANT TAKES OFF ITS SEED COAT.

Canada can conquer this country quicker by financing a string of first class summer resort hotels than by putting the money into a navy. Carnegie is being showered with honors, and he's doubtless consistent enough to guarantee a fund to maintain them.

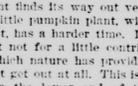


FIG. 8.—HOW A SQUASH PLANT TAKES OFF ITS SEED COAT.

Any one so disposed can add an hour to daylight on his own personal account without running against an injunction. Just to show the ultimate consumer that he is not ignored pictures that bear the age label are put on the free list.

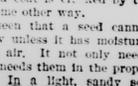


FIG. 9.—HOW A SQUASH PLANT TAKES OFF ITS SEED COAT.

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II.—How Plants Eat and Grow

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EVERY growing plant is a little factory. The green coloring matter of the leaves, or chlorophyll, is the engine. The sunlight is the power that makes the engine go, and the air, water and some of the substances in the soil are the raw materials.



FIG. 10.—THE GROWTH OF CORN ROOTS.

Under the stimulating influence of sunlight the chlorophyll takes the carbon dioxide gas of the air and the water, nitrogen and minerals which the roots send up in the form of crude sap and tears them to pieces. Then it puts them together again. It makes them into the starch of the potato or the sugar of the sugar beet. It puts them together in another way and makes the hard, horny gluten of a kernel of popcorn or the tough fiber of a cornstalk. By

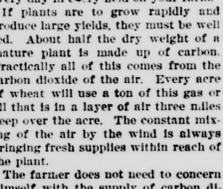


FIG. 11.—THE GROWTH OF CORN ROOTS.

building them up in still different ways it makes the hard wood of the oak or the delicate petals of a rose. Man, with all his skill and machinery, has never been able to make any products half so wonderful as are being made every day in every field of the farm.

If plants are to grow rapidly and produce large yields, they must be well fed. About half the dry weight of a mature plant is made up of carbon. Practically all of this comes from the carbon dioxide of the air. Every acre of wheat will use a ton of this gas or that is in a layer of air three miles deep over the acre. The constant mixing of the air by the wind is always bringing fresh supplies within reach of the plant.

The farmer does not need to concern himself with the supply of carbon dioxide, for every time he builds a fire or even breathes he is adding to the store of this material in the air.

The smooth upper surface of a leaf is both air and water tight. On the underside, however, are many small openings, which are really the mouths of the plant. It is through these tiny holes that carbon dioxide is taken into the leaf to be used by the chlorophyll. In making starch and other products out of carbon dioxide and water some oxygen is given off. This passes out through the openings in the leaves. Thus you see that plants breathe in much the same way as animals do, only they give off oxygen, the product which is used by animals, and take up carbon dioxide, the gas which is breathed out by animals. In this way plants make animal life possible. Animals give off carbon dioxide and manure as waste products. Plants tear these waste products to pieces and by rebuilding them make them once more into food for the animals.

Next to carbon hydrogen and oxygen are the foods that the plant uses in largest quantities. Since water is composed of these elements, the supply will be plentiful as long as there is plenty of water in the soil.

There is one element, nitrogen, which forms a considerable part of the plant, that is harder to get. While three-fourths of the air is nitrogen, the soil does not seem to be able to change it into a soluble form. The only kind of plants that can use the nitrogen in the air at all are the legumes, such as clover and alfalfa. Certain bacteria that live on the roots of these legumes have the power of changing the atmospheric nitrogen into a form in which the plant can use it. We shall study more about this process later.

Nitrogen is one of the most important plant foods, and it is one that is very often lacking. If the plant cannot get a sufficient supply of nitrogen it will be stunted, will stop growing early, and the yield will be very much reduced. Since all the crops, with the exception of the legumes, must get their nitrogen from the soil, the farmer must see to it that there is a plentiful supply there if he wishes to obtain a large yield.

If you will drop a little rich black soil on a hot shovel some of it will go up in smoke. The part that burns is humus and is made up of vegetable and animal matter which is partly decayed. This humus contains large amounts of nitrogen, and from this source the greater share of this element used by the plant must come. If your soil is black, spongy and well supplied with humus there is little danger that the plant will go hungry for nitrogen. One of the best ways to keep a field in this condition is to apply liberal quantities of barnyard manure. Another way is to plow under green crops, especially clover, a few times it is necessary to buy nitrogen for the plant in the form of commercial fertilizers, but this is a very expensive way of obtaining it.

Even when the plant is given all the nitrogen it can use it sometimes fails to do well. This is because it cannot get as much of the mineral elements as it needs.

Too much nitrogen in proportion to the amount of mineral elements causes the plant to "go all to vines." There will be an excessive growth of leaves, but the yield of grain will be small. Take an ear of corn or a bunch of hay and burn it. The ashes that are left are the mineral parts of the plant. These cannot be obtained from air or water, but must come from the soil. Some of the most important of these are iron, which is the substance that helps to build up chlorophyll, and sulfur, which is found in the nitrogenous parts of the plant. There are a number of others also, all of which are present in the soil in such large amounts that there will probably always be all that the crops can use.

Two of these minerals, however, potassium and phosphorus, are not so plentiful. When the plant cannot get enough potassium the grain will not be filled out well. If there is too little phosphorus, especially in the case of fruit trees, the development of the fruit is checked. Adding barnyard manure to the soil helps to keep up the supply of these two materials. On farms

where little stock is kept and where grain has been raised continually for years and little attention paid to the soil it is sometimes necessary to apply commercial fertilizers. These are phosphorus and potassium in the form of commercial fertilizers.

In the eastern part of this country there are many farms that have become so badly run down that crops will not grow at all unless they are fed with commercial fertilizers. These are very expensive, and it often takes nearly all a farmer's makes to pay his fertilizer bills. These farms would never have become so worn out if they had been properly cared for. Leaving plowed ground, especially on hillsides, exposed for several months during the fall and winter allows much plant food to wash away. Growing the same crop year after year wears out the land rapidly. Different crops require different kinds of food. By changing crops from year to year no one food material is used to excess and the others wasted. By keeping as much stock on the farm as possible, saving the manure carefully and spreading it on the fields before it rots or leaches away and by using leguminous plants to gather nitrogen the soil can be kept well supplied with plant food.

It is much more profitable to feed the crops in this way than to buy plant food on the market at excessive prices. Usually, however, the plant is hungry for the mineral elements not because they are not in the soil, but because they are in a form in which it cannot get at them. The roots of the plant spread all through the soil in search of food. If you will look at a little root through a magnifying glass you will see that it is covered with root hairs. It is through these root hairs that the plant takes up food from the soil. There are no openings directly into them, but the walls are so thin that the water can soak in. It is much more difficult to get substances of food, cannot get in, so that the plant food must be dissolved in water before it can get into the roots and so up to the chlorophyll, which is waiting to build it into seeds or leaves.

The soil has been worked until it is fine and loose each little particle

Our government lacks new American enterprise in China. Thus do the humble dollar and the flag put together for more foreign entanglement.

Lightweight earthquakes were long subjects for a joke, but so many have lately gone into the heavy weight class that a joke is now no laughing matter.

"Art cookery" sounds fine, but mother somehow got results from what was known in her day simply as a "knack at cooking."

One time is as good as any other for telling certain folks not to drink tea water. They won't heed it anyway.

'Twould be radical in the extreme to include in the anti-racing crusade the running of water.

A Boer Union In South Africa. A recent news dispatch announced a British surrender to the Boers in South Africa, although not in the frank terms here given. The people of the colony of Natal voted by a three-fourths majority to join the union of South Africa. This is the political chief of the Boers, the Boer arms triumphed twenty-eight years ago, and reversed the military victories of Lord Roberts seven years ago. The fortunes and future of the rich territory which has been the scene of so much fighting are to be controlled by the very element which lost in the armed struggles for supremacy at Ladysmith and Paardeburg.

Three of the four colonies forming the new union have long been under Boer control, and the federation has been effected on a basis which discriminates against the British population in favor of the Boers. The British predominate in Natal, yet they voluntarily face that discrimination in order to become a part of a great self-governing province. Thus in seven years the conquered Boers have acquired authority over their own affairs and in a vital degree over the affairs of their conquerors.

A little feinting might show that that escaped convict who has been raising crops and children for twenty-one years has done Mississippi more service than though he had put in his life sentence of the penitentiary bench.

Canada can conquer this country quicker by financing a string of first class summer resort hotels than by putting the money into a navy.

Carnegie is being showered with honors, and he's doubtless consistent enough to guarantee a fund to maintain them.

Any one so disposed can add an hour to daylight on his own personal account without running against an injunction.

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People's Institutes.

The recent commencement exercises at Cooper Union, New York, marked the completion of the first half century of that useful institution. Cooper Union was not the pioneer in teaching useful arts to prospective wage earners practically free of cost. Spring Garden Institute in Philadelphia had been in the field several years when Peter Cooper founded the New York school in 1849. Numerous schools similar in character have since been established in all the great cities, but the career of Cooper Union has not been interfered with. It opened with 2000 students, and over 3000 were admitted for 1908, while the new applications for the year numbered over 5000.

The training at popular institutes like Cooper Union bears directly upon the condition and needs of the student. This may account for the fact that they escape the criticism which falls upon the colleges. Students who enter these classes are of the type found working their way through the literary colleges. They are born workers seeking better tools. The atmosphere of the institutes encourages class work to the exclusion of everything else. The students meet only in the class room. Students come from all over the Union, and they retain to the end the ideals and ambition with which they set out. The Cooper Union school has been a success from the start, and, although its plan of work is essentially the same now that it was in 1849, it is abreast of the times. Peter Cooper saw into the future.

From all accounts the first Fourth was anything but a quiet one after it opened up, and the party that got the worst of it never would admit that it was safe and sane.

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HOW SHE KEEPS BEAUTIFUL.

The Mystery Solved.

Like the flowers that bloom in the spring the young girl just budding into womanhood is an inspiring sight and she is usually beautiful if she is perfectly healthy. She stays beautiful so long as her health and constitution remain good. Let her be nervous, have backache, sleepless nights, and when she does it takes for wrinkles, and her feet and dark circles to appear in the face? Her cheeks were rosy until she began to suffer from woman's weaknesses and the constantly recurring attacks of indigestion brought her quickly from the beautiful age to the premature middle age. It was not due to her unattractive, but civilized methods of living, and to the fact that so many neglect these small ills which soon lead up to larger ones. Nothing so drags a woman down as these constantly recurring periods when she suffers more and more from a chronic condition that can be easily cured. No woman should take an alcoholic compound for that will disturb digestion, and the food is quickly compacted and becomes hard and tough to digest. She must go to Nature for a cure. The native Indians of early times were far from womanly when they used a marvellously effective medicinal plant "Squaw root"—what the physicians of our day called Catholophyll or Blue Cohosh. This extract of the roots with Hydrastis or Golden Seal and Lady's Slipper root, combined in just the right proportions, made the very best tonic and cure for the distressing complaints which weaken a woman's vitality is Dr. Pierce's Favorite Prescription. Dr. Pierce not only assures you that his "Favorite Prescription" is honestly made, but he lets you know just what it contains.

The best of medical authorities recommend and extol the virtues of the above ingredients in "Favorite Prescription." Thus F. Ellingwood, M. D., Professor of Materia Medica, Bennett Medical College, Chicago, says of Golden Seal: "It is an important remedy in disorders of the female system, such as dysmenstruation, irregularity of the menstrual flow, and a general debility of the system. It is a very active, powerful and useful remedy." "Plays a very important part in diseases of women, the painful conditions incident to womanhood. In dysmenstrua it is surpassed by no other remedy. It is a powerful stimulant of the uterine system, and its action is tonic, but its effects are permanent." "For headache, whether congestive or from neuralgia or dysmenstrua it is a powerful remedy." "Dr. John King in the American Dispensary, says of Blue Cohosh root: "It is a very active, powerful and useful remedy." 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