

Dynamic Forces Practically Applied

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The growth of plants is outwardly determined by the kind of soil, nutrition, humus, climate, light, moisture or aridity, and other environmental factors. The soil-fertilizing air and moisture provide the plant with substances necessary for the upbuilding of its main bulk.

In recent years a special study has been made of another group of substances present in plant life in very minute quantities, but the bearers, nevertheless, it would seem, of the true dynamic forces. These substances are known as hormones (growth hormones in particular) ferments, vitamins, etc.* They are not nutrition in the sense of minerals, proteins and starches, but direct the growth of the organism. In a certain sense they represent bio-catalysts.

The best known is boron which regulates part of the physiological processes and, therefore, the state of health in certain plants. The most interesting case is that of brown heart disease in beets caused by boron deficiency.** A small quantity of boric acid (four pounds to the acre) spread on a field prevents this disease. More important probably is the regulation of the evaporation of water from the leaves in summer by reason of the presence of boron. In this case, and especially with clover and grasses, boron increases resistance to drought—a fact of the greatest agricultural importance for the general combating of drought. Once this was discovered it became of interest to determine whether the bio-dynamic products would show similar effects.

A Comparative Study of Boron and 501

Boron influences the respiration process in plant cells. It increases the reduction of the organic substances in the plasma so that finally hydrogen is set free. This can easily be shown in a laboratory experiment since certain dyes like methylene blue are transformed through hydrogen in the status nascendi into colorless substances. Boas has made the following experiment: cubes of equal size are cut from potatoes and put in test tubes. A few cc of methylene blue solution (1:50,000) are added. The reduction of the methylene blue through living potato tissue starts and after twenty-four hours the blue color has disappeared—provided, of course, that only healthy tissue has been used. Even the little cubes which were blue in the beginning have lost that tint. If a 3 per cent solution is added no bleaching occurs. This solution destroys the living tissue without reduction. Boric acid applied in a high dilution increases the reduction. The best effect is attained if an 0.0006 per cent solution is used. It is interesting to see that up to this point the more the solution is diluted the greater the bleaching effect.

This simple technique has been applied not only to boron but to the bio-dynamic preparations 502-507. Solutions of from 0.6 to 0.0006 have been used with the result that a strong effect upon the potato tissue was ob-

*cf. "Dynamic Forces" Vol. 1, No. 1/2 Bio-Dynamics.

**cf. "Hunger Signs in Crops" edited by Gove Hambridge.

served. The enzymatic fermentation has been increased with the preparations 501, 502, 503, 505, 507, in such a way that it surpassed the best boric acid concentration. The preparations 500, 504 and 506 were second to the best boric acid concentration. A second experiment with 501 and a hundred test tubes with potato cubes has confirmed this finding. The increase of respiratory effect was 15 to 20 per cent as compared with the best possible result obtained by boric acid. However, a peculiar fact was observed, namely, that the effect of boric acid depends upon the concentration, whereas the bio-dynamic preparations show the same effect with any concentration that is, the high dilution is just as powerful as the concentrated dilution. This shows clearly that we have to deal with a dynamic effect because it is independent of the number of molecules present. The bio-dynamic preparations react as true bio-catalysts. Furthermore, the experiment proves that 501 successfully replaces boron.

Geotropism and 501

Another group of experiments dealt with the geotropism and phototropism of plants. Geotropism is the principle that plant roots grow towards the center of the earth, and phototropism the principle that the shoots grow in the opposite direction, towards the light. Science has discovered that these properties are produced by certain substances present in plants in very high dilutions, namely, auxines and hetero-auxines.

The normal sensibility of a root—the vegetation-point of the root-tip contains a very sensitive organ for geotropism—can be paralyzed by certain chemicals—eosin being one of them, which in a dilution of 1:10,000 so paralyzes the orientation of the roots that they no longer grow towards the earth's center but in any other direction. Only after several hours do the roots recover their original sensitivity.

The auxines are sensitive to light. It is presumed that they are mobilized through light. The paralyzing effects are produced by fluorescent dyes which exclude light and therefore reduce sensitivity to light.

Following our experience the bio-dynamic preparation 501 increases all the processes in a plant which have a relationship to light. If there is a disturbance of the geotropism or phototropism 501 can heal it. The following experiments demonstrate this. Square glass plates, 3 x 3 inches, are covered with a thin layer of moist clay; linseed are introduced into the clay for the purpose of germination. The glass plates stand on cork so that the seeds sprout downward. The whole paraphernalia is put into petri dishes with moist filter paper to prevent drying out. The experiment has to be made at a constant temperature of 25 degrees. With normal positive geotropism the roots grow vertically downward. When the roots are from 3 to 4 mm long, the glass plates are turned upside down so that the roots are now forced to grow upward. After about three hours the roots turn like a hook in order to grow back toward the earth—which is called positive geotropism. If before turning the glass plates the roots are put for only a few seconds into an eosin bath, they completely lose their orientation and grow in any direction. After about twelve hours this paralyzing effect disappears and the roots start growing earthward again. Eighteen hours after the eosin bath they be-

have normally. The experiment has been divided into two—one as described above, the other so performed that, after the eosin bath, the roots were for fifteen seconds dipped into an aqua solution of 501. 0.5 gram of 501 has been stirred into three gallons of water such as is always used in bio-dynamic practice.

The result was that the roots treated with eosin and afterwards with 501 did not lose their geotropism. To avoid the objection that the 501 bath washed away the eosin's effect, a bunch of roots was dipped fifteen seconds into distilled water. The following table gives the final result:

POSITIVE GEOTROPISM

1. Roots untreated	95%
2. Roots treated with eosin	10%
3. Roots treated with eosin and afterwards with 501	87%
4. Roots treated with eosin and afterwards with distilled water	20%

Summary: the preparation 501 reacts like light and enables the plant to resist paralyzing effects as to geotropism and phototropism.

The Agricultural Application of 501

Since 501 reacts like light, it is permissible to assume that, like light, it stimulates assimilation.* Obviously, its effect on plant-life being so important, it should be applied at the proper moment. Theoretically, the right moment occurs at the beginning of the growing season just when the lengthening and leaf-assimilation starts. To find this proper moment experiments with wheat, oats, barley and sunflowers have been made.

The preparation 501 is applied following the usual procedure.

1. With the development of the second leaf.
2. With the beginning of more intensified growth, e. g. with the third stem development.
3. Toward the end of developing new stems.
4. After blossoming.
5. Control without 501.

For illustration of the effects a few examples are given below:

EXPERIMENT WITH WHEAT NO. L. 108

Group	Stooling Out	1000 Seed Weight in Grams	Yield Plant in Grams	Yield Per Acre Bushel (Approx.)
1.	5	48.4	12.1	36
2.	8	50.0	19.2	56
3.	7	48.0	16.0	47
4.	6	48.0	15.0	44
5.	6	46.0	13.3	38

The best effect is shown if 501 is given at the beginning of the growth of stems. If the application is given too early or there is no gift of 501 the yield is poor. The great difference in the yield indicates the importance of

*Laboratory experiments demonstrating this will be published later on.

the proper use of 501. Everyone can draw his own conclusion as to whether it "pays" to use 501 or not.

EXPERIMENT WITH OATS No. L. 109

Group	Stooling Out	1000 Seed Weight in Grams	Yield Plant in Grams	Yield Per Acre Bushel (Approx.)
1.	3	38.0	16.1	47
2.	4	38.8	19.8	58
3.	3	36.9	14.7	43
5.	3	34.7	18.6	55

Result: Same conclusion as for wheat.

The experiments made with preparation 501 showed that this preparation is able to heal the damaging effect of certain dye substances like eosin. Another bio-dynamic preparation with a similar effect is 507. It is made of valeriana officinalis, the juice pressed out of the valerian blossom being used. In practice this juice, in a dilution 1:10,000, is added to the compost or manure heap in order to transmit this beneficial effect via the humus to all plants. The same kind of experiments as for 501 has been used for the demonstration of 507 in order to show the healing effect on a disturbed geotropism.

After the plants were turned around 180°, i. e. upside down, the roots restored the disturbed geotropism with the following percentages:

1st group: untreated seeds	94%
2d group: seed treated with eosin	12%
3d group: seed treated with eosin then "healed" with 507	89%
4th group: seed treated with distilled water	23%

The experiment shows clearly the "light" effect of 507.

The bio-dynamic preparation No. 501 is made from quartz (rock crystal) which has undergone a long process of activation. If instead of the treated 501 just the original raw material of quartz is used, only a 34% healing effect is obtained as compared with 87% with the treated quartz (501). The particular bio-dynamic process of activation, therefore, is necessary in order to obtain satisfactory results.

EXPERIMENT WITH BARLEY No. L. 110

Group	Stooling Out	1000 Seed Weight in Grams	Yield Plant in Grams
1.	4-20	63.5	24.0
2.	10-22	67.0	36.8
3.	6-30	60.5	26.0
3.	6-30	60.5	36.0
5.	4-22	58.0	24.7

Result: The same as for other grains. In this case the proper application of 501 is remarkably successful. As in the other case the use of 501 during the blossoming period should be avoided.

EXPERIMENT WITH SPINACH NO. L. 138A

	Yield Plant in Grams, after 7 wks.	Observations
1. Control without 501	14.4	much blossom started
2. 501 applied when the first leaves developed	14.5	very little blossom
3. 501 when the third leaf started	15.5	about the same
4. 501 when the plant was well developed	12.4	much blossom started

Result: The influence of 501 is beneficent as to the formation of green leaves, e. g. for the assimilation process, and delays the plant's going to seed if applied between the formation of the second and third leaves. The going to seed is very undesirable in spinach; therefore, 501 keeps the spinach in the more useful state of growth for a longer period.

For the study of the assimilation process sunflowers are very often used. Their large green leaves offer an opportunity for observation and analysis of the growth process of the substances like chlorophyll which are the bearers of assimilation.

The influence of 501 upon the assimilation of sunflower plants has been studied with the following results:

1ST EXPERIMENT WITH SUNFLOWER NO. D 331

	with 501	without 501
Height of sunflower	8'8"	7'4"
Number of flowers per plant	18	12
Weight of green leaves per plant	350 grams	100 grams

2D EXPERIMENT WITH SUNFLOWER NO. D 381

Average number of flowers (large) per plant	6.6	2.9
Average number of flowers (small) per plant	3.4	0.7
Seeds already ripe per plant	0.6	4.7
Average weight of green leaves per plant	381.0 grams	334.0 grams

Both experiments give average figure of 25 plants each.

This result is self explanatory and shows the superior effect of the preparation 501 as to growth.

Conclusion: 501 should be given at the moment when the plant starts its full development, sufficient root system having been developed. If 501 is given too early, then the plant will develop a strong, juicy, thick root at the expense of the upper parts. This effect, however, could be eliminated through a second spraying with 501 later on. Even if applied at the proper moment, its effect is augmented by a second spraying. Indeed this is especially advisable in wet seasons with little sunshine, and after winters with much moisture and little sunshine. Evidently, in such cases, 501 is a substitute for sunlight. To a certain extent it wipes out the bad effect of too much moisture. In greenhouses where part of the light is absorbed by the glass 501 should be sprayed at regular intervals. If the first dose of 501 is given too late, it forces the plant to mature too early, a thing which does no harm in a wet year but which nevertheless should not be done to lettuce, spinach and other green leafed plants inasmuch as it causes them to blossom.