Soil Modifier KT-E

Introduction

Nowadays, because of people's environmental consciousness, organic agriculture and natural farming methods which are less burdensome to the environment are becoming more widely recognized. Consumers' demand for crops grown with less chemical fertilizer and pesticide is growing year by year.

However, in modern agriculture, chemical fertilizer and pesticide is used to increase harvest rate as well as stabilize harvests, and also as measures against disease and insect damage.

Until very recently, honey buckets had been seen throughout the country, but have now been replaced with chemical fertilizer even in rural areas.

Vegetables sold at supermarkets or greengrocers have good color and luster, and have almost no worm-eaten spots. These are the results of the manufacturing system many farmers developed in the 20th century based on government policy and consumer needs. Production volume has increased, and disease and insect damage have decreased. That being said, the agriculture of the 21st century is facing new challenges such as environmental destruction caused by the continuous use of chemical fertilizers and pesticides, damage from disease and insects which are more harmful to vegetation, and accumulation of hazardous substances in humans, as well as correlations with various allergic reactions. Under such circumstances, manufacturers are being forced to deal with more advanced issues such as production increase and stabilization, and cost reduction. They must also take new countermeasures against disease and insect damage and against chain failures.

Characteristics

・KT-E removes hazardous substances such as nitrate nitrogen which has been stored in soil by repeated dumping of chemical fertilizer and is hazardous to plants and animals.

・KT-E decreases the use of chemical fertilizers and pesticides even if only slightly.

By multi-dumping chemical fertilizer into soil, extremely highly toxic substances such as nitrate nitrogen are stored in soil. They destroy the original ecosystem of soil to a great degree, and as a result, microorganisms useful to crops decrease, and only specific pathogens and pests easily thrive. Suppressing excess use of chemical fertilizer is the basis of soil making, and it can lead to environmental protection.

There are some fertilizers plants can absorb directly. However, most fertilizers are decomposed by microorganisms in soil and replaced in a certain form before being absorbed by plants. If we could raise the efficiency of decomposition by microorganisms, we could decrease the use of chemical fertilizer.

Soil modifier KT-E has the effect of adjusting microorganism balance in the soil. There are some data indicating it is possible to reduce the use of chemical fertilizer with the use of KT-E.

※This is not to guarantee a 50% reduction in the use of chemical fertilizer under any circumstances.

Growth Comparison by relative amounts of Fertilizer and KT-E

Crop: rice

Process	Number of grains per plant	Fruition Rate (%)	Plant Height (cm)	Weight of 1,000 grains (g)	Harvest Rate (%)
Target Area	104.5	82.2	15.1	23.5	100
Use of KT-E (3g/㎡)	92	90.6	16.1	25.4	138.8
Use of compound fertilizer (50g/㎡)	101.7	92.8	16.2	24.1	161.3
Use of compound fertilizer (50g/㎡) ＋KT-E(3g/㎡)	111.7	95.7	16.9	25.1	216.0

Use of compound fertilizer (25g/㎡) ＋KT-E(3g/㎡) ・With half the amount of fertilizer, size of harvest went up 80%.	**107.3**	**94.5**	**16.7**	**25.5**	**186.8**

Crop: Chinese cabbage

Process	Average Weight of Head (kg)	Yield per Unit (kg)
Target Area	1.8	7016
Use of KT-E (3g/㎡)	3.0	11694
Use of compound fertilizer (30g/㎡)	3.1	12084
Use of compound fertilizer (30g/㎡) ＋KT-E(3g/㎡)	4.2	16372
Use of compound fertilizer (18g/㎡) ＋KT-E(3g/㎡)	**3.7**	**14423**

Compound fertilizer contains 15% nitrogen, 15% phosphorus and 15% potassium.

Adjusting the ecological balance in soil and creating an environment amenable to beneficial microorganisms and small animals can lead to improvement of fertility.

Crop Immunity Improvement

- **Improvement in pathogen immunity**
- **Improvement in pest resistance**

Vegetation has its own natural immunity, and crops naturally have the ability to fight disease and pests. Like animals, vegetation can grow healthy and strong by ingesting the necessary amount of nutrients, as opposed to use of medicine, and it exerts defense against disease and insect damage.

In agriculture, specific treatments against specific disease and insects are necessary at times. However, excess use of pesticides could destroy the ecological balance in soil.

If crops' vitality increases, and if it becomes possible to prevent diseases by exerting defensive capability, we can decrease the use of pesticides. Bacillus Subtilis contained in soil modifier KT-E is known to have the ability to protect crops from pathogens. KT-E not only has this ability of Bacillus Subtilis but also helps vegetation to efficiently absorb nutrition from soil and stimulates healthy growth of vegetation.

KT-E supports the organic cultivation and organic and natural agriculture of the 21st century, and facilitates not only environmental protection through microorganism-assisted fertility improvement but also healthy growth of crops.

With the help of KT-E, vegetation absorbs sufficient nutrition and raises vitality. Increased crop yields and improved taste have been confirmed among a variety of crops.

Effect of Bacteria

Normally, many types of bacteria inhabit soil. KT-E contains bacteria taken from soil and then sorted and mixed. These bacteria interact and have an important effect on plant growth.

The bacteria contained in KT-E inhabit plant roots and multiply by decomposing and absorbing nutrients in soil, and in the process generate nutrients and supply them to plant roots. The vegetation gains vitality by absorbing sufficient nutrients from KT-E.

Test Items

Eggplants, tomatoes, cucumbers, green onions, soy beans, carrots, corn, melons, potatoes, rice, green peppers, pea sprouts, Chinese chives and many other items have been evaluated regarding effectiveness. As a result of farmland testing, a small to 40% increase in crop yields, quality improvement (including taste), and a decline in pest damage were confirmed in all cases.

Partial Test Result

Test Item	Unit	Komatsuna			Garden Radish		
		Standard Area	Test Area	Ratio	Standard Area	Test Area	Ratio
Weight	g	57.85	63.18	**1.09**	37.85	55.52	**1.47**
Moisture	%	93.7	92.4	0.99	92.7	93.7	1.01
Potassium	mg/100g	540(312)	604(382)	**1.22**	642 (243)	608(338)	**1.39**

Weight is the number of grams per pot (three plants). For komatsuna, only the edible part is considered. For garden radish, leaves are included. For items not listed, weight is the number of grams per 100g of the edible part.
The parenthesized numbers are calculated by multiplying the number of grams per 100g by the weight.

Ratio is calculated by dividing the parenthesized number of the test area by the parenthesized number of the standard area.

Mechanism for Improving Crop Yields

Several kinds of soil bacteria (Bacillus.spp) are blended in KT-E at a specific rate. In recent academic papers, it is reported that these soil bacteria blended in KT-E perform a physiological function in improving crop yields (a number of cases were reported in the past couple of years). Even currently, new data regarding the soil bacteria used in KT-E are being accumulated at research institutes around the world in the same way as other bacteria, and to date the following basic facts have become apparent.

Bacillus microorganisms in KT-E are considered to be among plant growth-promoting rhizosphere cell groups (PGPR), and the influences PGPR exert on plants (crops) are

(1) PGPR changes unavailable-formed nutrients that plants cannot utilize to available-formed nutrients that plants can utilize.
(2) The value of above-ground parts and underground parts, which is one of the indexes that shows growth degree of plants, increases in proportion to the number of microorganisms.
(3) The secretion of microorganisms is a plant hormone influencing plant physiology.
(4) There is a possibility that secondary metabolites contribute to plants' disease resistance.

By the function of (1), plants can efficiently absorb nutrients contained in soil.
(2) indicates that more growth can be anticipated with the existence of microorganisms in soil.
(3) indicates facilitated plant growth is expected due to the influence on plant physiology.
In the case of (4), plants' healthy growth is expected when the soil condition is adjusted by microorganisms.

By growing crops by using KT-E, it may be inferred that the functions mentioned above influence one another and facilitate plant growth.
Soil modifier KT-E can create animate soil that is tolerant to chain failure, and immunity to pests rises due to healthy growth of vegetables and fruit trees.

Protection against Chain Failure

What is chain failure?

Chain failure is the generic term for the phenomenon of poor growth which occurs when the same crop is grown on the same soil successively. Three common causes are listed below.

The Causes of Chain Failure

・Through the continued existence of an environment amenable to specific pathogens and pests, such pathogens and pests multiply and ruin crops.

・When crops continually absorb a specific nutrient, deviation of the nutrient occurs.

・Specific toxins that crops emit are stored. Toxins can be divided roughly into two kinds, toxins (such as potatoes or radish emit) emitted as a defense against pests, and toxins emitted to inhibit other plants' growth.

Besides the above mentioned causes, in recent years, the accumulation of salts occurring especially from multi-throwing of chemical fertilizer has been remarked upon as a cause.

To avoid chain failure, it is necessary to conduct crop rotation or leave land fallow at certain intervals and rotate arable lands in order to naturally decompose toxins and bases and to store nutrients and wait until pathogens and pests decrease.

Countermeasure against Chain Failure Caused by Soil Bacteria

Other than crop rotation, one of the countermeasures since ancient times conducted during soil production is to plow fallen leaves and rice straw into agricultural fields. Fallen leaves and rice straw contain a large amount of Bacillus Subtilis, which has attracted attention in recent years and has the capability to decompose organic matter. Moreover, the ability to prevent penetration of pathogens into plants has received recent notice.

In order to facilitate such capabilities made possible by Bacillus Subtilis, four more kinds of natural soil bacteria are formulated into KT-E to enhance the capability to adjust the balance of bacteria in soil.

KT-E also contains an extremely large number of Bacillus Subtilis. 700 million bacteria (including Bacillus Subtilis and others) are contained in one gram of KT-E, which is an overwhelming amount compared to other general microbial materials. These bacteria operate intensively around crop roots and make a greater effect possible.

Facilitating Crumb Structure of Soil

Improving resistance against pests through crop vitality

KT-E facilitates the crumb structure of soil and produces fluffy soil. As a result, crops such as vegetables and fruit can absorb more nutrients efficiently, which brings strong growth to roots, leaves and stems. Therefore they can absorb more nutrients more efficiently. This is the positive cycle KT-E produces. The healthy growth of crops can improve the resistance against diseases and pests. Moreover, since the bacteria contained in KT-E decompose and absorb organic matter more efficiently compared to other bacteria such as pathogens, they steal the nutrient source for the pathogen, and as a result, the plants grow to have greater resistance to disease.

Compatible with Any Soil

A sufficient effect can be expected even on lands with insufficient nutrients or sun exposure. The main component of KT-E is not an enzyme itself, which sets it apart from many other products on the market. KT-E continuously generates enzymes around the plant roots in soil.

It is formulated with a certain balance of bacteria so that the bacteria can act on one another for mutual benefit, and thus is compatible with various states of soil.