

Pilot of World Agricultural Production technology

PE Input and Activation Technology

Developed by “Zhejiang Longyou Orient Agrochemicals Co., Ltd.”, Protein Elicitor (PE) input and activation technology is a world-leading biological technology of agricultural production, which participated in 863 Project and 973 Project of the Ministry of Science and Technology of the State since 2003, and successfully passed the check. Up to now, it’s the second time for this technology to be selected into 863 Project and is now under way.

Briefly speaking, “PE input and activation technology”, through spraying protein genes on crop’s leaves, sends directives to relevant receptor proteins of the crops to activate their immunity, therefore achieving disease prevention and pest resistance, triggering metabolic system of plants, and enhancing their growth. Rather than a pesticide or fertilizer, it serves the same function as do they, but is free from their destructive effect on the ecological environment. It can prevent crops from illnesses like what vaccines do, and also raise crops’ ability to absorb fertilizers and photosynthesis, thus realizing higher output and harvest.

So far from 2001, “PE input and activation technology” has been tested on over 50 different crop species in more than 100,000 mu (15 mu = 1 hectare) of field in 22 provinces and municipalities. Statistics suggest that, after being applied with this technology, rice, wheat, cotton, tea, tobacco and vegetables have gained disease-resistance rate of at least 80%, output increase of 10%, and a higher grade of product quality.

This technology involves its core: “3% super slim alternaha tenuissima activator protein” (activator protein for short), a series of products and major application methods. Its major functions cover preventing plant virus diseases, systematic illnesses and insect pests, promoting growth of crops’ roots and stems, raising utilization rate of fertilizers, improving photosynthesis and fruit reservation, etc. As this technology doesn’t change DNA of crops, it won’t result in genetically modified products, drug-resistance, poison, chemicals, remains in plants and soil. As an integrated management technology of farmland, it has lunched a new revolution of agriculture.

It’s generally acknowledged that virus diseases and systematic diseases are cancers of plants, which may lead to dramatic decrease in output and quality of grains, oil plants, vegetables, fruit trees, flowers, etc. They can produce unimaginable losses as do insect pests. Since China is heavily stricken by such diseases, there is 20 – 30 % failure of crops every year. On the other hand, 1.8

million tons of insecticides applied each year have resulted in shocking damage to the ecological environment; the harm of fertilizer to soil and environment also has posed an urgent problem to the relationship between agriculture and earth environment.

“PE input and activation technology” was just invented to replace insecticides and fertilizers which endanger our environment, and with its development of product series, enjoys quite a lot of advantages like convenient usage, reasonable price, saving on expense (of purchasing agricultural equipment, and labor force to spray drugs, prevent diseases, and do picking and selection), increasing income (from output rise and quality upgrading). Its advent and maturity mark a new height of China’s agricultural and biological technology.

Zhejiang Longyou Orient Agrochemicals Co., Ltd. holds in esteem the idea of “for the Earth ecology, for the world people”. “PE input and activation technology” can meet China’s demand for pollution-free produces, green products and organic products, solve the pollution problem caused by insecticide remains, guarantee the state’s grain safety, raise quality of , and lead Chinese agriculture to a long-term, stable and sustainable development.

Introduction to Function Mechanism and Trait of Activator Protein

1. Brief introduction

“3% super slim alternaha tenuissima activator protein” (activator protein for short), core product of PE (Protein Elicitor) input and activation technique, is a type of thermal stable protein extracted from fungi, consisting of proteins of molecular weight varying between 35 and 68 KD. It can induce and activate immunity potential of plants, increase their resistance to diseases and insects, adjust their metabolic system, promote growth, raise crop output and improve crop quality.

Plant activator proteins, through interaction with receptor proteins on surface of plants, can induce signal conduction of plants, activate a succession of metabolic adjustment response of plants, thus to produce resistance to diseases and insects in plants, to promote their growth, improve crop quality and increase crop output. Regarding to the functional mechanism of such type of proteins, it’s internationally accepted that such proteins, after applied to plants, first combine with the receptor proteins on the surface of plants, which, after receiving signal conduction from the activator proteins, then activate a series of metabolic reaction to promote the synthesis of Salicylic acid and jasmonic acid, which, in turn, make phytoalexin and other disease-proof-related proteins to resist diseases and insects.

After treated with activator proteins, plants can see rise of praline, peroxidase, root dehydrogenase, etc. As these enzymes are directly related to stress resistance of plants, activator proteins can induce them to be active to enhance plants' ability to resist diseases, insect pests and stress. This function of plant activator proteins can be widely applied as they can prevent and cure such disease as grey mould, wilt, anthracnose, ulceration, xanthomonas, and tobacco mosaic virus. At the same time, they are effective to resist aphides, spider mite, etc. and can enhance the effect of Bt. Years of field tests have approved that it's widely applicable to various types of crops like tomato, chili, watermelon, strawberry, cotton, wheat, rice, tobacco, orange, Chinese cabbage, rape, etc.

So far, there are only three types of immunity insecticides of proteins under the research in the world: harpin protein, elicitor protein, and activator protein. Compared with the previous two types of proteins, activator protein enjoys a better avidity, thermal stability, and medical effect, but without allergic reaction of plants. As a type of environment-friendly biological product, plant activator protein is more efficient, low in toxin and remains. After a wide-spread use, a successive application of two to three years will bring a better effect since it will not only reduce frequency and amount of chemical insecticides, but also notably raise output, increase the value added of agricultural products, as well as give a boost to ecological protection, and food safety and agricultural product export of China.

2. Functional mechanism and performance of activator protein

1) Functional mechanism

A. Plant acquired immunity activator

Such type of proteins, after sprayed to plants, first combines on plant surface with receptor proteins, which, after receiving and conducting signals of immunity activator proteins, can stimulate a series of metabolic reaction within the body of plants, and then start plants' immunity system to promote the synthesis of Salicylic acid and jasmonic acid, which, in turn, make phytoalexin and other disease-proof-related proteins to resist diseases and insects.

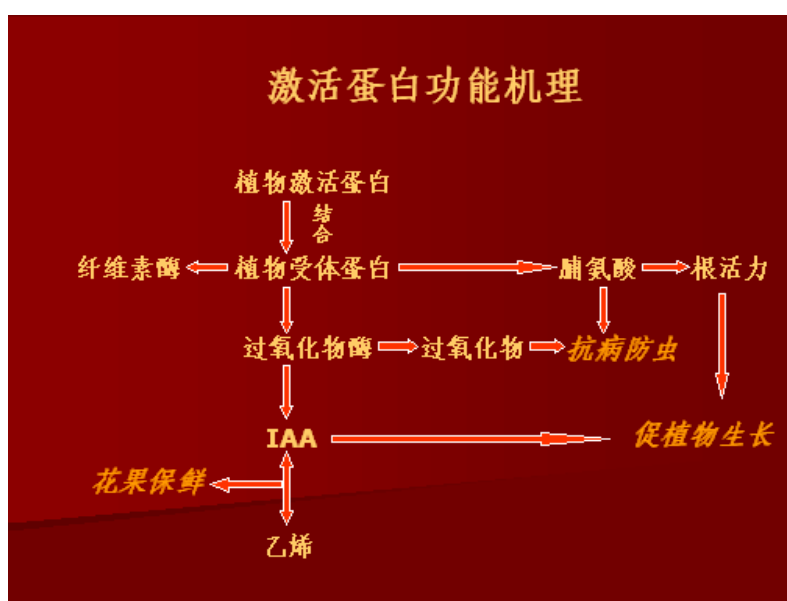
B. Starter of anti-disease and insect gene expression of plants

It can activator five anti-stress genes of the plant of its own, and one gene related to growth and development.

C. Effect enhancer of plant's ability to resist diseases and insects

About 15 minutes after receptor proteins combine with activator proteins, cellulolytic enzymes within the body of the plant start to increase; 30 minutes later, peroxidase begin to rise to promote the amount of Indole-3-acetic acid; 90 minutes later, praline increases within the plant's body to improve the vigor of roots, therefore enhancing the plant's ability to absorb fertilizer and promoting the growth of the plant. Activator proteins can induce the enhanced vitality of five enzymes which are associated to photosynthesis and tricarboxylic acid cycle. These enzymes are directly related to stress-resistance of plants, so their enhanced ability means improved disease-resistance, inducing and activating metabolic system, improving the growth of plants, crop quality, and raising crop output.

Map of the Functional Mechanism of Activator Protein



Resource: Plant Protection Research Institute of the Chinese Academy of Agricultural Science

Research shows that after treated with fungi-originated plant activator proteins, plants see an increase of praline, peroxidase and root dehydrogenase. These enzymes are directly related to stress-resistance of plants, so to activator and induce them means to improve plants' ability to resist disease and stress.

2) Performance

A. Promoting root at seedling stage

Used to treat seeds and sprayed on seedling beds, this type of proteins can notable improve the growth of such seedlings' root as rice, wheat, corn, cotton, tobacco, vegetables, rape, etc. Fresh root can increase 5% to 11% in weight, while dry root, 8% to 13%. Seedlings will have longer roots and dense leaves, and stronger stems.

B. Promoting growth at nutrient stage

Activator proteins can promote both the split and stretch of cells, and raise the amount of chlorophyll in foliage to improve photosynthetic products. Crops will have deeper and stretched leaves, the same growth rate, and strong stems.

C. Promoting fruits at breeding stage

It can raise the sprouting rate and fertilization rate of pollen, thus to increase the chance of production, especially for some less-advantageous section of crops. Plants will have more, heavier and better fruits.

D. Resisting disease and insect pest

It can adjust the metabolic system of plants to activate their own immunity system, then to resist diseases and insect pests

E. High stability of products

The product can be effective for over two years when vacuum-packed.

3) Characters and features

Safe

This product is different from hormone, antibiotic or genetically-modified product, and free from any toxin, harm, remains or pollution.

Efficient

Activator proteins are highly active, so effective dosage of biological proteins for each mu (15 mu = 1 hectare) is 24 – 36 mg.

Effective

Crops in wide fields can increase by more than 8% while fruits, vegetables and commercial crops can reach 10-20%.

Easy

It's easy to manipulate and it can be applied to soaking seeds, spraying, and irrigating roots.

Broad-spectrum

It's effective for quite a range of fruits and vegetable to raise quality, output and resist diseases and insects.

Stress-resistant

It can activate plants' own defense system, enhance their ability to resist diseases and insects, and withstand unfavorable environment.

Environment-friendly

This product is friendly to the environment, available to green and organic manufacturing, and conducive to the sustainable development of agriculture.

3. Effect of activator protein

In recently years, activator proteins have been applied to over 50 crops like strawberry, tobacco, Chinese cabbage, rice, chili, and orange in more than 100,000 field tests in 22 provinces and municipalities. It's suggested from the test results that 1000 times solution of activator proteins, after succession use of 3 to 4 times, can induce certain resistance in many types of crops, especially resistance to virus disease. Disease resistance can reach 80%, output can increase 10% at least, and quality of crops can also rise to a higher grade. A successive use of 2-3 years will have an exceptional effect.

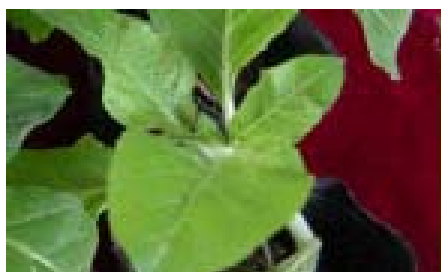
Strawberry: dilute it for 1000 times for spraying. First spray in early April. After an interval of 25 to 30 days, apply 2 – 3 times. Then strawberries will show prosperous growth, high plants, deeper color, and thicker leaves. It can effectively prevent grey mould, powdery mildew, white leaf spot, spider mite, etc. and at the same time noticeably promote the growth and improve the quality.



With activator protein

without activator protein

Tobacco: dilute 1000 times for spraying. Apply it four times respectively at the seedling stage, on the 5th to 7th day after the transplantation, at the rosette period and at the fast-growing period. The plants will have obvious growth in height, leaves and their surface will increase whilst mosaic disease and blight will decrease by 70.18%. Meanwhile, it also has obvious positive effect on tobacco's quality. Soluble sugar, reducing sugar and total sugar content all see increase in tobacco leaves. "Application and Benefit Certificate" of tobacco from the Plant Protection and Check Station of Yongzhou of Hunan Province shows that activator proteins can help raise income of 220.5 RMB Yuan for each mu (15 mu = 1 hectare).



With activator protein

Without activator protein

Chinese cabbage: activator proteins can effectively prevent virus disease of Chinese cabbages, and also help to prevent soft rot disease, anthracnose disease and downy mildew disease in a certain way. Chinese cabbage will have higher plants, longer and broader leaves, 13% higher output, and certain rise of vitamin C and proteins.



Chinese cabbage – without activator protein (left) , with activator protein (right)

Chili: Activator proteins are effective in preventing virus diseases, epidemic diseases, southern blight and anthracnose disease. Chilies show booming growth, height rise of 2.50 cm, flourishing branches, dark leaves, and rising fruit setting by 5 – 10%. Output and quality of chili see obvious rise as the fruits have thicker flesh and brighter color.



chili – without activator protein (left) , with activator protein (right)

Orange: Activator can effectively prevent citrus fuliginous and drive away spider mites. Orange trees show much deeper green leaves with more chlorophyll, and rise of fruit setting by 7.38%. At the same time, orange sugar content, soluble solid content, vitamin C and titratable acid all have obvious rise.



Orange – treated with activator protein (left), without activator protein (right)