



VIRESCO (UK) LTD

**MAIL ORDER
CATALOGUE**

Humates

Fulvic Acid

Viresco™ Micro-Organism Products

Fertilisers

Seaweeds

and Other Associated Products

HORTICULTURE



Viresco (UK) Ltd
50A Market Place
Thirsk
North Yorkshire
YO7 1LH

Tel: 01845 525585

Fax: 01845 523133

E-mail: sales@viresco-uk.com

www.viresco-uk.com



MAIL ORDER CATALOGUE - HORTICULTURE

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HUMATES

Introduction

Humate is a pure and highly active natural compound formed from the decomposition of plant matter over thousands of years. Humate has been researched and tested for more than 30 years in the USA and is being acclaimed by many growers for its benefits. Repeated treatment of soils and composts with artificial fertilisers and chemicals cause soils to become drained of their humic content which is the natural promoter of growth for plant life. Humate is being used by the professional grower and turfcare specialist as well as the gardener and gives a number of benefits. Humate is a mild biostimulant and, as such, improves the functioning of plant systems as vitamins do in animals. With Humate, plants make better use of nutrients that are made available to them and respond accordingly. Benefits that can be obtained using Humates are:-

- more massive and deeper root systems
- increased uptake of nutrients
- greater resistance to stress caused by excesses of heat or cold or drought
- improvement in vigour and ability to survive
- increased size and yield of fruits and vegetables
- increased microbial activity

Humate International Inc. of Florida are the manufacturers of these humic acid materials and they have linked up with Aqua-Aid Inc. who are specialist suppliers of wetting agents. We are the UK agents for the humic acid products of Humate International as well as the wetting agents from Aqua-Aid. Some of these wetting agents contain Humate. Aqua-Aid also supply other specialist products, some of which we sell.

We first came across Humate in a report of some work done by Robert L Willcox in 1988. He had done this work at golf courses in the USA and had set up a number of different trials. The Root Development Trial at Pine Tree Golf Club at Boynton was of particular interest.

On 4 fairways, 15 trial plots were established. Three of these were used as control. This trial took place between 26.4.88 and 6.7.88. Grass type was Ormond Bermuda. The initial length of the grass root was 5".

After the 9 weeks of the trial, the grass in the control plots had grown to about 6" of root length. However, the other 12 test plots, all treated with granular Humate alone, with liquid Humate alone or with both granular and liquid Humate, showed increases in root length to between 9" and 13"! The best results came from those plots treated with both granular and liquid.



Having seen what Humate could do to improve root length in grass, we wondered what it might do to other plants. We approached the President of Humate International and, early in 1992, obtained the agency for the products for the UK and Ireland.

We are selling the Humate products into all areas of horticulture and the results we expected when we took on the agency have materialised. The use of very small amounts of these products can have a tremendous effect on plants and their growth. Humate is a very effective natural growth stimulant, the results of which can usually be seen very quickly. We try to persuade amateur growers, in their first season of using the product, to use it only on a proportion of their plants and to then compare the "with" and "without" treatments.

HUMATES



Two of our Humate products, granular Humate Ag and liquid Humate Ls, were the subject of part of a 1993 research programme at Leeds University. This study, by Ramadan A. Mohamed, was entitled "The mobilization of Cu, Zn, Fe and Mn to wheat by the influence of humate Ls and Ag in calcareous soil".

He states in his conclusion that "in general, plant uptake of Cu, Zn, Fe and Mn were significantly increased with accompanied humate Ls and Ag treatments." He adds, in an accompanying letter to his report, that the results are significantly important for using these Humate treatments in world agriculture to improve nutrients uptake in chalky soil and to free complex nutrients from the soil. Take-up of the four micro-nutrients mentioned when the wheat leaves were examined after 5 and 10 weeks was approximately double with the Humate treated growing medium compared to the untreated medium. The pH of the soil in the trial was 7.2.



The ability of Humate to assist in the take-up of these micro-nutrients is quite phenomenal and demonstrates that Humate is an exceptional chelating material, that is, it combines well with metallic ions.

Professor Michael Hayes of the Chemical and Environmental Sciences Department at the University of Limerick is a recent Past President of the International Humic Substances Society. He knows Humate International Inc. and its products well. In an open letter dated February 1st 1999, he writes:-

"During the course of the past year I have had the opportunity to observe in the USA the performance of humic substances (HS) marketed by Humate International with regard to the promotion of growth of grasses in liquid culture during the course of growth chamber studies. I was impressed by what I saw. Several products were included in the testing programme and that of Humate International was the best tested in so far as root length and weight of foliage was concerned.

Many claims are made with regard to the benefits for plant growth of humic products. Some of these have come from unreliable sources. However, I do know that HI (Humate International) takes a very responsible approach to the testing of their materials, and I am not aware of any claim made by that Company that cannot be substantiated. Their success in the market place is testimony of the satisfaction of the users.

The enhanced yields, increased resistance to pests and diseases, and the improved qualities of products are among the benefits claimed from applications of HS. There is an enormous lack of awareness of the importance of HS in the environment. There are, for example, three times more HS below the surface of the earth than there is living matter on the surface. HS in the soil environment are considered to be almost as essential to life as is photosynthesis. That is because of their vital role preserving the soil aggregate (crumb), and the soil aggregate is essential for providing the environment where plant roots can prosper. Destroy the soil aggregate and agriculture as we know it would be ruined. We are not yet at the stage where we can support animal life without the soil."

COMPARATIVE HUMIC ACID TESTS

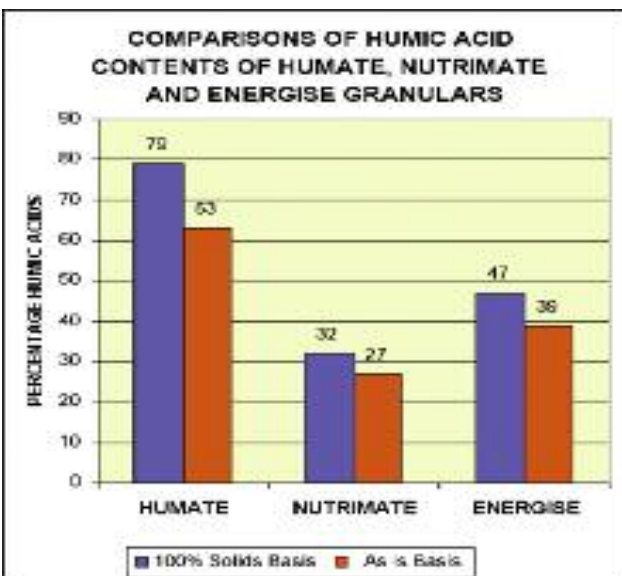
Introduction

As pointed out earlier, our Humate is a very active form of humic acid, and to our knowledge, there is no other humic substance available on the world market that has the quality that our Humate possesses. The aforementioned comments from Professor Michael Hayes support this. In 2002, two other granular humic acids were independently tested against our Humate. The other two products are sourced from the USA and are sold in the UK under the names Nutrimate and Energise. We understand these two products are based on leonardite, a partially oxidised form of lignite.

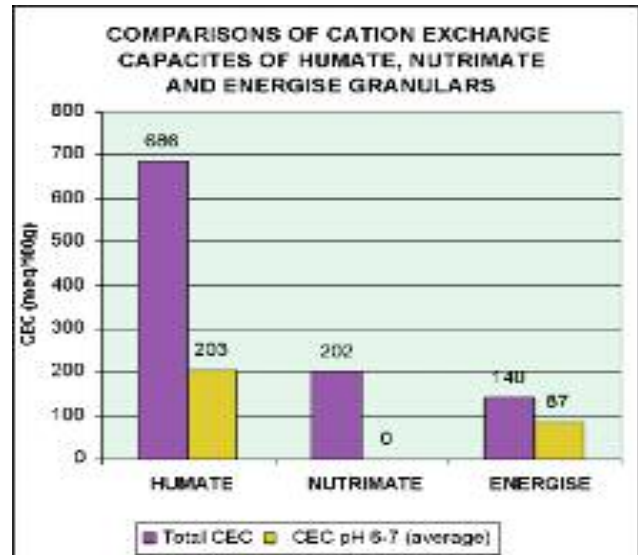
The 2002 Tests

Three separate tests were carried out by three independent research laboratories. The first test was a measurement of the total humic acids present in the three products. This was checked on a "100% solids basis" as well on an "as-is basis". This work was done at A & L Western Agricultural Laboratories, Modesto, California.

	Humate	Nutrimate	Energise
Humic Acids (%)			
100% Solids Basis	79%	32%	47%
As-is Basis	63%	27%	39%
CEC (meq/100g)			
Total	686	202	140
Av pH 6 to pH7	203	zero	87



The second test compared the Cation Exchange Capacities (CEC) of the three humic acids. This was done at the laboratory of a past president of the International Humic Substances Society.



It can be seen from the above that our Humate contains considerably more humic acids than the other two materials. On the 100% solids basis, our Humate has 147% more humic acid than Nutrimate and 68% more than Energise. On an as-is basis, Humate has 133% and 61% more than Nutrimate and Energise.

The total cation exchange capacity of Humate is considerably greater than the CEC's of the two other products. Where the total CEC was measured, that of our Humate is 3.45 times greater than that of Nutrimate and 4.93 times greater than that of Energise. The second set of readings of CEC is the average of two readings taken at pH6 and pH7. These pH levels are found typically in many horticultural applications. These average CEC's of all three products are well below the total CEC's but in the case of Nutrimate, its figure is so low as to be insignificant. This average CEC of Humate is 133% greater than that of Energise.

Humate International now has available a Humate with a CEC of 985 meq/100g. This is an increase of over 40% of that tested.

Bear in mind that the higher the CEC, the better chelator is the product.

HUMATES



The third series of tests measured the metals analysis of the three products. Seventeen different metals were analysed. The sum of all these metals added up to 2949ppm in the case of our Humate, 22281ppm for Nutrimate and 8538ppm for Energise. The total for our Humate is considerably less than the other two products. This is to be expected as these metals analyses relate to the amount of materials other than humic acid in these products. With the humic acid content very high in our Humate and very low in the other two materials, we would expect to see much higher contents of metals in the other two products compared with our Humate.

Some specific metals analyses are given in the table below.

Metals Analysis (ppm)

	Humate	Nutrimate	Energise
Calcium (Ca)	638	7203	2435
Iron (Fe)	1083	5931	2948
Potassium (K)	132	831	163
Magnesium (Mg)	49	1404	138
Sodium (Na)	39	965	419
Silicon (Si)	776	5653	2251
Total (17 metals)	2949	22281	8538

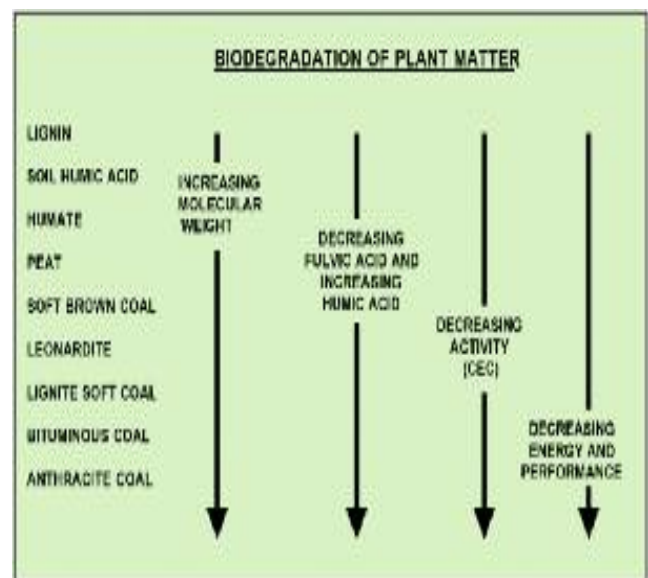
The silicon figures relate to the amount of silica (silicon oxide), ie sand, in the products.

From the above table, the amount of silicon in Nutrimate is 7.28 times higher than that in our Humate. The silicon in Energise contains 2.90 times as much silicon as does our Humate. Thus, when the other two products are bought, relatively large quantities of inert silica (sand) are being paid for.

Sodium is a metal that is not required in growing media. It is usually associated with chloride, ie common salt. The sodium level in Nutrimate is about 24 times the amount in our Humate. Energise contains about 10 times more than our Humate.

Humic acids should perhaps better be described as humic substances. Humic substances contain both humic acid and fulvic acid. The humic acid molecule is a very large molecule and can vary greatly in composition. Humic acid is a polymer, ie a series of molecules all linked together. The single molecule, ie the monomer, is called fulvic acid.

The larger the proportion of fulvic acid to humic acid in a humic substance, then usually the more reactive that humic material is. Whilst no specific tests were done in 2002 to determine the proportion of fulvic acid in the three products mentioned above, we know that our Humate contains something around 25% fulvic acid of the total humic substances. Humic substances derived from leonardite usually contain less than 2% fulvic acid.



HUMATE Ag GRANULAR

Humate Ag is the basic compound from which all the Humate products are derived. It composition is approximately 70% organic (humic and fulvic acids) and 30% inorganic.

We offer three different grades of granular Humate to the amateur gardener. These are:-

Humate Ag6	less than 3.4mm down to powder
Humate Ag1635	1.2mm to 0.5mm
Humate Ag50	less than 0.3mm

Usage rates

As a general guide, add 1 to 2kg of Humate to one cubic metre of organic based compost. This is equivalent to about two to four level teaspoonfuls to a 2 gallon bucket. For composts containing larger proportions of mineral aggregates, eg perlite/grit, then more granular Humate should be used. For spreading on to soil, apply Humate at the rate of 60 to 90 grams per square metre (2 to 3 ounces per square yard) and rake/dig evenly into the top 10 to 15 centimetres (4 to 6 inches).

For normal potting and for outside work, Humate Ag 6, sized down from 3.4mm, is best used. However, for plants in small pots, eg in the alpine world, the Ag1635 is recommended. The grains of this grade will be better distributed in these small volume pots. On lawns, Humate Ag1635 should be spread as a top dressing at the rate of about 2kg per 100 square metres two times a year, spring and autumn. Using greater amounts than those recommended would normally not give any additional benefits.

Humate Ag breaks down slowly over time, releasing the beneficial compounds. It is best used in conjunction with liquid Humate Ls and a good fertiliser programme.

Code	Product	Pack Size
H06K/010	Humate Ag 6	1kg
H16K/010	Humate Ag1635	1kg
H50K/010	Humate Ag50	1kg

HUMATE Ls LIQUID

Humate Ls liquid is manufactured from granular Humate and is a solution of potassium salts. The humic and fulvic acid content is between 15% and 17%. It is a faster acting version of the granular product and is ideally applied both

to foliage and to the roots in a liquid fertiliser solution. Its frequency of use is about fortnightly in the growing season.

Usage Rates

On turf: Use 25 to 50ml per 100m² appropriately diluted. Repeat after 7 to 14 days. Then apply 50ml diluted per 100m² fortnightly during the season.

Compost mixing: Add 50ml diluted in water to one cubic metre of compost. (5ml diluted to 100 litres of compost.)

Seed soaking: Soak seed in a solution of Humate Ls, ie 5ml in 100ml of water.

Root dipping: Mix 5ml (1 teaspoonful) in 500ml water and dip roots in solution for 2 to 3 minutes.

Watering: Mix 5 ml (1 teaspoon) in 10 litres (approximately 2 gallons) of water for plants in situ. For pot and container plants, use 1/2 teaspoon in 2 gallons. Use liquid Humate Ls every two weeks, with or without fertiliser.

For seedlings, use at half strength

Code	Product	Pack Size
HULM/500	Humate Ls	500ml
HULL/010	Humate Ls	1 litre

HUMATE IRON CHELATE

Soluble Powder - 10% Fe

Humate Iron Chelate is used for correcting deficiencies of iron in soils and composts. It is suitable for most types of plants including turf, ornamentals, fruit and vegetables. It is effective across a broad range of soil and climatic conditions, works well in both acid and alkaline soils and is effective for greening-up ornamentals and turf. It is based on Humate which is reacted with iron and spray dried. The analysis is total nitrogen 6.0%, soluble potash 2.0% and chelated iron 10.0%.

Usage rates

For watering containerised plants: Dissolve 2 1/2g of chelate (approximately 1/2 level teaspoonful) in 10 litres (2 gallons) of water.

For plants in situ: Use at 3 times above strength. Watering frequency is as required to correct chlorosis (yellow foliage through lack of chlorophyll).

We have had some very good feedback from people using this product for acid loving plants and trees such as rhododendrons, azaleas, magnolias and heathers.

Code	Product	Pack Size
HFCG/100	Iron Chelate	2 x 50g

HUMATE PRODUCTS



HUMATE STRESS RELIEVER

Use Humate Stress Reliever on plants for recovery from stress conditions due to transplanting, temperature extremes, drought, herbicide burn and heavy traffic on turf. Use diluted on its own or also in solution with fertiliser. It is acceptable in solutions from pH 6 to pH 8. Humate Stress Reliever is a solution of organic and biochemical matter derived from seaweed extracts in Humate Ls liquid. The analysis is total nitrogen 4%, available phosphoric acid as P₂O₅ 2%, soluble potash as K₂O 1%, magnesium as Mg (chelated) 0.5%, manganese as Mn (chelated) 0.25%, iron as Fe (chelated) 2.5%, zinc as Zn (chelated) 0.15%, boron as B 0.01%, molybdenum as Mo 0.05% and sulphur as S 2.5% plus seaweed based organic extracts all in a 6% Humate solution.

Usage Rates

For turf: Apply 125ml of appropriately diluted Humate Stress Reliever per 100m² on highly stressed areas. Repeat after 7 days at half rate (63ml per 100m²) for optimal effect and then revert to standard Humate Ls programme. For thatch and disease control, use as above every 2 to 3 months.

For the grower: Dilute 5 ml (1 teaspoonful) of Stress Reliever in 6½ litres (1½ gallons) of water used to water plants. Apply when plants are transplanted and once every 3 months thereafter.

Code	Product	Pack Size
HSRM/100	Stress Reliever	100ml
HSRM/250	Stress Reliever	250ml

AQUA-ROOT

Wetting Agent Plus Humate

Aqua-Root is a mixture of Aqua-Aid wetter and Humate, both at double strength. When combined with Aqua-Aid, Humate and water become more available to the root zone, improving the benefits of Humate and the effectiveness of water. Aqua-Root increases the cation exchange capacity in the soil and saves water by modifying its surface tension and releasing trapped micronutrients. It improves germination of seed and stimulates root length and density at reduced levels of fertiliser use. It also improves soil structure and moisture retention.

Usage Rates

For turf, shrubs, ornamentals, bedding plants and vegetables: Use 25 to 50 ml appropriately diluted per 100m² twice during the first month. Repeat approximately monthly.

For adding to composts at the mixing stage: Use 5ml per 100 litres of seedling compost and 10ml for other composts, diluted in as much water as necessary for good distribution.

For general watering of plants in containers: 5ml per 10 litres of water, with or without liquid fertiliser, and drench. Repeat monthly.

Code	Product	Pack Size
ARTM/250	Aqua-Root	250ml

AQUA-ROOT PLUS IRON

Wetting Agent, Humate and Iron

Aqua-Root plus Iron is a mixture of Aqua-Aid wetter, Humate and 3% organically chelated iron. Aqua-Root plus Iron is effective both in rootzone uptake and as a foliar spray. The benefits of Humate, the effectiveness of water and the take-up of iron are improved. Aqua-Root plus Iron increases the cation exchange capacity (CEC) in the soil and saves water by modifying water surface tension and releasing trapped micro-nutrients. It increases root length and density at lower levels of fertiliser use as well as improving soil structure and moisture retention.

Usage Rates

For turf: Use 60 to 120ml per 100m² appropriately diluted every month during active growth

For shrubs, trees, ornamentals and bedding plants: Use 120 to 180ml, appropriately diluted, per 100m², 2 to 4 times per year during active growth.

For individual trees: Use 50ml per inch caliper diameter of the tree 2 to 4 times per year during active growth.

For general watering of plants in containers: Use 5ml per 10 litres of water, with or without liquid fertiliser, and drench. Repeat monthly.

Code	Product	Pack Size
ARFM/250	Aqua-Root plus Iron	250ml

HUMATE REJUVENATOR

Humate Rejuvenator is a mixture of granular Humate growth enhancer, Probiotic slow release organic based fertiliser and calcium in the ration of 5: 4: 1.

The Probiotic fertiliser is derived from raisin stems, urea, alfalfa meal, rice bran and kelp meal. It requires aerobic conditions to release its nutrients successfully. Granular Humate is approximately 70% organic (humic and fulvic acids) and 30% inorganics. Humate is a mild biostimulant and improves the functioning of plant systems as vitamins do in animals. With Humate, plants make better use of nutrients and respond accordingly.

The benefits that can be obtained using Humates include the following:

- More massive and deeper root systems
- Increased uptake of nutrients
- Greater resistance to stress
- Improvement in vigour and ability to survive
- Increased size/yield of fruit and vegetables
- Increased populations of soil microbes

Analysis

Total Nitrogen (N)	4.5%
of which 3.6% is urea nitrogen	
0.9% is water insoluble nitrogen	
Available Phosphate (P ₂ O ₅)	0.0%
Soluble Potash (K ₂ O)	2.5%
Calcium (CaCO ₃)	2.9%

Directions for Use

Rejuvenator is best used in the top 2 inches of growing medium as it requires aerobic conditions to effectively release the nutrients from the Probiotic fertiliser. Use it at the rate of about 100g per square metre (3 ounces per square yard) and work into the top few inches of soil or other growing medium. Alternatively, mix 4 teaspoonsful of Rejuvenator into a 2 gallon bucket (20g into 10 litres) of well aerated, open compost. Rejuvenator breaks down slowly over time, releasing the beneficial compounds.

Code	Product	Pack Size
HREK/010	Humate Rejuvenator	1kg

FULVIC ACID

Background

Humic substances are mixtures of both humic acids and fulvic acids. Fulvic acid is that part of a humic substance that is soluble in all pH conditions. Humic acids are completely soluble only in alkaline conditions.

The proportion of fulvic acid in a humic substance is important. The higher it is, the more reactive the substance is. The amounts of fulvic acid present in leonardite based humic substances is usually very small, ie less than 2%. Our Humate contains between 20 and 25% fulvic acid.

The molecular structure of humic substances is quite complex. Fulvic acid is usually looked upon as a single molecule, ie a monomer, whereas the molecule of humic acid is thought to be a group of single molecules joined together to form a giant molecule, ie a polymer.

The fact that the fulvic acid molecule is relatively small means it can enter the plant, attached to some nutrient ion, much more readily than the much larger humic acid molecule. Fulvic acid is sometimes said to be the "work-horse" amongst humic substances. This is a reflection of its effectiveness as an organic chelating agent.

Fulvic acid has a very high cation exchange capacity (CEC) and will increase the CEC of growing media.



HUMATE PRODUCTS



Our Fulvic Acid

We have a soluble fulvic acid material that contains 70% fulvic acid and 5% humic acid as potassium salts. The potassium content is about 18% along with small amounts of nitrogen (2%), calcium (1%), sulphur (1%) and phosphorus (0.3%).

Fulvic acid can be used as a foliar treatment where ideally it should be added to solutions of foliar feeds. It will aid photosynthesis.

It can also be applied to soils and other growing media to improve the take-up of nutrients. It will improve the texture of soils and is best used in solutions of fertilisers. The powder has a tendency to take up moisture and become sticky. We have therefore packed the product into small soluble capsules. One to two capsules, each of 1.37ml volume (approx 1g), should be added to 2½ litres (half a gallon) of liquid feed that is used for foliar treatment.

Use 2 to 4 capsules per 2½ litres (half a gallon) of water or feed solution for application to growing media.

Frequency of use should be every 3 to 4 weeks in the growing season.



Code	Product	Pack Size
FULU/025	Fulvic Acid	25 Capsules
FULU/050	Fulvic Acid	50 Capsules



**WANT TO GROW
ACID-LOVING PLANTS
IN ALKALINE SOILS?**

THEN USE OUR HUMATES.

**Humate Ag (granular),
Humate Ls (liquid) and,
Humate Iron Chelate.**

Magnolias,
Camellias,
Heathers,
Azaleas,
Rhododendrons etc
can be successfully grown
in situ using our Humates.

Introduction

Alongside the Humate products, we have been selling micro-organism products under the name Viresco™ for about 10 years. As a result of what we have seen, we now are of the view that fungicides need no longer be used and insecticides use can be reduced dramatically.



We do not know what chemicals have been used in the cultivation of the fruit and vegetables that we buy and eat. As a part response to this concern, chemicals are being increasingly taken out of use because of the possible harmful effects that they may cause when treated produce is eaten.

The use of chemicals can and does cause imbalances in the soil and other growing media. These chemicals are used to help increase yield, to reduce disease and to cut down on pests. Whilst these aims may be achieved, another consequence is that the growing medium is put out of balance in respect to microbial populations and problems then arise.

A good soil or other growing medium is a living soil. It is the home of numerous micro-organisms and other life forms representing many genera and species. The numbers, kinds and activities of these organisms are influenced by the food available or organic content of the soil, soil texture, pH, moisture, temperature, aeration and other factors. They live according to the rule of the survival

of the fittest. In some soils, a few of the micro-organisms may parasitise or injure plant roots. The vast majority, however, perform beneficial functions that are important for the soil and the plant.

Some micro-organisms, eg yeasts and yeast-like enzymes, live on leaf and fruit surfaces. Others, especially bacteria, are present in very large numbers on living root surfaces where they feed on excreted organic food materials such as organic acids, sugars and discarded cell debris. Some are best adapted to decompose dead roots and other plant residues and others slowly utilise the more resistant soil humic substances formed through microbial activity.

To give an indication of the numbers of micro-organisms present in good soils, it is estimated that the weight of live micro-organisms would vary from about 500kg to 2000kg per hectare. The primitive forms of plant micro-organisms include bacteria, actinomycetes, fungi and algae. Protozoa and nematodes are soil animals.

The table below gives an indication of the numbers of organisms present in 1 gram of good fertile soil.

BACTERIA	3,000,000 to 500,000,000 in 1 gram
ACTINOMYCETES	1,000,000 to 20,000,000 in 1 gram
FUNGI	5,000 to 1,000,000 in 1 gram
YEASTS	1,000 to 100,000 in 1 gram
PROTOZOA	1,000 to 500,000 in 1 gram
ALGAE	1,000 to 500,000 in 1 gram
NEMATODES	10 to 5,000 in 10 grams

In addition, there are large numbers of microbial viruses, slime moulds, insects and earthworms.





Pesticides are applied to soils or plants to kill or control plant pests including disease micro-organisms. Much of the material that is applied to foliage may also reach the soil. Most of the insecticide chemicals, if used according to instructions, will not have a permanent effect on soil micro-organisms. Whilst they may kill a large number of soil and leaf insects, they have little effect on soil bacteria and fungi. However, soil fumigants and some fungicides kill large numbers of soil micro-organisms. After the initial kill, organisms not killed, or certain species which quickly re-establish, become dominant and may reach numbers far in excess of those in the untreated soil. This is illustrated in the table below and is a very good example of how pesticide chemicals can put a growing medium out of balance.

EFFECT OF FUMIGATION ON THE NUMBERS OF BACTERIA IN A YOKO LOAM SOIL (pH 7.4).

Treatment	Millions of Bacteria per gram after:		
	1 day	10 days	50 days
None	37	29	19
D-D(400lb/acre)	21	88	48
Chloropicrin(200lb/acre)	4	96	61

Soil micro-organisms have several important functions. These are:-

1. Decomposition of organic residues with release of nutrient element constituents, eg nitrogen, phosphorus and sulphur.
2. Formation of beneficial soil humus through their activities in decomposing organic residues and through the synthesis of new compounds and polymers.
3. Improvement of soil physical properties such as better aggregation or tilth, better infiltration of water and improved aeration.
4. Release of plant nutrient elements such as phosphorus, potassium, iron etc from insoluble inorganic minerals.
5. Fixation of nitrogen by utilising gaseous nitrogen from the air and synthesising it into protein and other cellular organic compounds containing nitrogen.
6. Improvement of plant nutrition through mycorrhizal relationships between fungi and plant roots.
7. Antagonistic action against plant pathogens which destroy plant roots.

The above figures, particularly for the treatment with chloropicrin, illustrate well what can happen to the numbers of bacteria in soils when fumigants are used. With chloropicrin, only one day after treatment, 37 million bacteria per gram have been reduced to just 4 million. However, those 4 million, after a further 9 days, had increased to 96 million. This is over three times the number found in the untreated soil after the same time interval. Thus, quite large imbalances can occur that can cause subsequent growing problems.



THE VIRESCO™/HUMATE APPROACH

Background

Soil is a complex system of animals, plant roots and micro-organisms, all acting to create a healthy growing environment. A good soil contains a lot of air; water circulates through the soil; nutrients are available in mineral and complex forms.

Plant roots secrete complex organic compounds which attract micro-organisms. With the proper support mechanisms in place, these micro-organisms perform all the functions required in the soil - they decompose organic matter to form humus; they produce polysaccharides to stick soil particles together, aggregating the soil and thus creating open spaces for air, water, nutrients and the micro-organisms; they fix nitrogen and make other nutrients available through the conversion of humic acid compounds to structures compatible with the plant so they can be absorbed.



The result is a well balanced soil which provides the environment for the growth of healthy plants with improved resistance to soil pathogens and other stresses, more efficient utilisation of nutrients and increased flower/crop production.

Modern cultivation practices have greatly increased the production of plants and crops. However, in the process, they have reduced the organic matter and created serious imbalances in the soil. Repeat growing of the same plants/crops and the use of synthetic fertilisers have provided the environment for the proliferation of many types of pathogens. The utilisation of various fungicides etc to overcome these pathogens have created new imbalances. With time, the situation has continued to worsen and the search for solutions has intensified our approach to provide the humic and fulvic acids and a broad spectrum of micro-organisms with the enzymes, micro and macro nutrients, polymers and wetting agents to support their activity. The result is a properly balanced soil, a stronger/more massive root system and a healthier, more stress resistant plant with the correct balance of nutrients to:

- Improve biomass, flower and crop production
- Efficiently utilise available nutrients
- Resist pathogens and other stresses
- Create a less appealing environment for insects

When the plant has served its purpose, organic substances are returned to the soil to produce new humus and to release nutrients back into the soil. The "Full Circle" is complete.

Our micro-organism products are sold to the amateur gardener under the name Viresco™. The same products are being sold to the trade - mainly to the golf green-keeper and nurseryman. There are a number of primary Viresco™ products and these contain around 50 different species of micro-organism. As dry powders, the numbers of micro-organisms vary from about 100,000 to 1,000,000,000 per gram in the mixes. When they are put into water, the numbers increase dramatically. Thus, when the Viresco™ products are used, the level of microbial activity in growing media can be greatly increased and kept at the higher level.

The presence of these Viresco™ microbial products can enhance the growth and subsequent yield of all manner of plants. At the same time, these micro-organisms can suppress other micro-organisms that cause fungal and bacterial diseases. It has been found that the use of these products has a positive suppression against rust, leaf rot, botrytis, fusarium and some other 30 identified pathogens including a variety of moulds.

Viresco™ micro-organisms products will not cure a disease once it has happened. However they can prevent it from happening in the first place.

Some plants benefit from being grown in the same soil/growing medium year after year. One major factor that influences this is where there is a build up of beneficial mycorrhizal fungi amongst the roots. Onions and leeks are plants which benefit from the presence of these mycorrhizas. In the bonsai world, oak, beech and pine also benefit by having good levels of mycorrhizas present. Use of the Viresco™ products give an enhancement to any native mycorrhizas present in the growing medium. Bear in mind that when growing trenches or beds are treated with disinfectant chemicals to kill off those micro-organism products that cause disease, other micro-organisms, including the mycorrhizas, are also removed or reduced. Our products, whilst suppressing those fungi that cause disease, do so by putting the soil into a balanced situation.

In 2000 we introduced a new mycorrhizal based Viresco™ product containing 11 different mycorrhizal fungi species.



The use of these Viresco™ products has an interesting effect on predatory insect type pests, eg spider mite, white fly, green fly etc. As already mentioned, our microbial products bring the soil or other growing medium into balance. By this we mean that we put into place in the soil, or other growing medium, enough competing micro-organisms to prevent any pathogenic micro-organism from becoming predominant enough for it to create a disease situation. The resulting balanced soil situation will promote the growth of healthy plants which increases their resistance to stress. Healthy plants emit a different frequency radiation than unhealthy plants. This may sometimes be seen as a different colour, for example a deep, blue-green. This radiation is then a signal to insects to leave these plants alone. Less healthy plants have more yellow-green in their leaves and this attracts the leaf pests, which alight in an attempt to kill off the plant. This is an example of nature's way of dealing with sickly plants. The intention is that these plants should not form seed to continue a weak strain into the future. Natural selection of the stronger plants is therefore made to produce future generations.

One of our customers in the USA has equipment that can measure the wavelength of the radiation (ie colour) from leaves. With this equipment, he has found that the radiation changes within minutes of the application of the micro-organism products to soft tissue plants and within hours when applied to trees and shrubs.

Viresco™ for Vegetables

Many vegetable growers are turning more and more to organic cultivation. Others who might wish to adopt such growing methods reluctantly use fungicides and insecticides to keep their crops clear of problems. Our micro-organism technology and products now give growers the opportunity to greatly reduce their dependence on chemicals and the probability that they may be able to eliminate chemicals entirely.



We have some information from an organic grower in Texas who produces over 40 different varieties of crops. He has been using our micro-organism products since 1992. He now uses no fungicides, no insecticides and only spent mushroom compost as a nutrient source. He has no diseases, no leaf pests, greatly increased yields and, most importantly, far superior crop quality in the form of better flavour, appearance and shelf life.

Over the four year period from 1992 to 1995 he conducted trials on many of his crops. He was able to show increases in yields of between 37% to 86% for tomatoes, 52% to 73% for cucumbers and similar increases for other crops. It was also shown that there was a reduction in the numbers of days to harvest.

Our Viresco™ products are being used in one of two basic ways. Firstly, after a sterilising programme, they can be used to re-inoculate growing media with micro-organisms as our products contain very large numbers of a wide range of micro-organism species. As stated previously, the large numbers of micro-organisms introduced put the growing medium into a balanced situation such that any residual pathogenic micro-organisms in the growing medium not killed by the sterilisation are unable to create a disease situation. This is a "belt and braces" approach. Alternatively, the Viresco™ products can be used without the previous application of fungicides or other sterilants. This will be the trend in the future and already there are growers who are adopting this approach. To repeat what was said earlier, this latter method allows beneficial mycorrhizal fungi to continue to thrive.

We now have a number of exhibition leek growers who no longer use a winter sterilant treatment on their trenches. We were also informed by an exhibitor at a major end-of-season show in 1999 in the North East that he has been able to clear botrytis from his onion bed by using Viresco™. He admitted that it had taken him three seasons to do it but he had persevered and eventually was successful. He happened to win the prize for the best exhibit of three dressed onions at the show and won the prize for the best vegetable exhibit in the show as well.

Our Viresco™ micro-organism products stimulate the activity of all micro-organisms including mycorrhizas and the combination of bacteria, actinomycetes and fungi in our products provide the competition and balance in the soil to make everything work properly. As long as this environment is kept in balance, there should be no problems with disease.

Thus, Viresco™ Micro-Organism based products, used in conjunction with humates, might be said to be the ultimate in gardening. They will:

- **suppress disease**
- **banish pests**
- **improve health and vigour**
- **increase growth and yields**
- **reduce fertiliser requirements**
- **enhance resistance to stress**

Summary

In summary, we would like to suggest that nature does not cause the plant disease. Nature has put micro-organisms into the soil for a purpose and a disease situation is created when one of these micro-organisms moves out of balance. It is man that puts the situation out of balance.



Disease Suppression

The Viresco™ products do not cure a disease once it has happened as would a fungicide. Viresco™ products suppress a disease, in that they tend to prevent it happening in the first place. This is achieved by putting the growing medium and plant into a balanced situation and arises by the introduction of a large number of a wide range of different microbes to both the growing medium and leaf. As a result, those microbes that might otherwise form a root or leaf disease do not get out of hand and become predominant enough to form the disease.

An article in the Autumn 1998 issue of the Newsletter of the Fritillaria Section of the Alpine Garden Society which referred to Viresco™. It was written by Dr. Bob Wallis and was entitled "Fungal Attack: if you can't beat them, join them". This referred to fritillaria keeling-over disease (FKOD). His answer to this fungal problem was to "infect the compost with the goodies so the baddies don't get a look in" and "use no fungicides". He uses Viresco™ as the source of the "goodies"!



Because each microbial species has a place in nature, we do not like to refer to "goodies" and "baddies". However, Bob Wallis' words make our approach easier to understand. Ensure that the "goodies" are present in sufficient numbers so the "baddies" do not show as a disease.

Healthy, unstressed plants are less likely to become diseased and the use of Humate and Viresco™ products will produce healthier, stronger plants that are more resistant to diseases.

In summary, the results of using Humate and Viresco™ programmes are a properly balanced soil, a stronger/more massive root system and healthier, stress resistant plants with the correct balance of nutrients to:

- Improve biomass and flower production
- Efficiently utilise available nutrient sources
- Increase resistance to pathogens & other stresses
- Reduce pressure from insects
- Bio-remediate soil toxins and toxic residues
- Decrease water, fertiliser & pesticide needs





Mycorrhizas

Mycorrhizas are fungi which live in harmony amongst plant roots. Both plant and fungus obtain benefits from this association.

There are seven distinct types of mycorrhizas but only four of these are of relevance in commercial and amateur horticulture. These four are orchid mycorrhizas, ericoid mycorrhizas, ectotrophic mycorrhizas and endotrophic mycorrhizas.



Orchid Mycorrhizas

Orchid growers are aware that for successful growing of orchids, mycorrhizal fungi are required. Orchids go through a very long seedling stage and during this time, the plants are unable to photosynthesise. They are totally dependent on the mycorrhizal fungus amongst their roots which supply all the plants' carbohydrate requirements at this time. For most orchids, the fungus supplies carbon and other nutrients throughout their entire life.

Ericoid Mycorrhizas

This type of mycorrhizal fungus only lives amongst heathers. It forms both a sheath around the tips of the roots and also penetrates the roots. An exchange of nutrients takes place with the fungus receiving carbohydrates from the plant and the plant receiving mineral nutrients from the fungus. Heathers tend to grow in lean, peaty soils and, without the presence of the mycorrhizas, the root systems of the heathers would not be able to cope with taking up nutrients on their own. Another benefit of these ericoid mycorrhizas is that they are very efficient at taking in metal ions which otherwise could be toxic to the plants. Examples are aluminium and iron which are very soluble at the low pH of peaty soils.

Ectotrophic Mycorrhizas

These type of mycorrhizas are very widespread and virtually every species of tree is associated with ectomycorrhizas. Like the ericoid mycorrhizas, they form a sheath outside the root tip of the tree without penetrating it.

There is again an exchange of nutrients between plant and fungus. The tree receives mainly nitrogen and phosphorus from the fungus and the fungus receives carbohydrates from the tree. These ectomycorrhizas can live quite successfully without an association with a living tree. They can live on decaying organic matter and most of the toadstools seen on a forest floor are the fruiting bodies of ectomycorrhiza. However, it is more beneficial for the fungus to associate itself with tree roots as it involves less energy to take carbohydrates from tree roots rather than to secrete enzymes in order to break down the litter on the woodland floor.

Endotrophic (Arbuscular) Mycorrhizas

These types of mycorrhizal fungi are associated mainly with soft tissue plants and some types of woody subjects. These fungi do not form a sheath around plant roots. Instead the hyphae (strands) of the fungus penetrate the root of the host plant and grow within the cell walls. They form structures within the root that are called arbuscules. These are the sites of the nutrient exchange. As with the other types, mineral nutrients are passed to the plant from the fungus and carbohydrates are passed to the fungus. Unlike ectomycorrhizas, endomycorrhizal fungi cannot survive without the host plant. They cannot obtain their carbon by decomposition. They do not produce toadstools. Their spores are invisible to the naked eye and are formed in the soil. It is estimated that about 70% of the herbaceous plants of the world are associated with endotrophic mycorrhizas.

These endomycorrhizas give more benefits to the host plants than the other types of mycorrhizas. They give, as others do, an improved uptake of phosphorus and both ammonium and nitrate to the plant. They also give an improved uptake of trace minerals to the plant, eg zinc and copper. However, they also give other benefits to the plant. These include an increase in the resistance to drought, to diseases and to insect pests.

In turf, where endomycorrhizas are being applied externally, the uptake of phosphorus and nitrogen is not very relevant as there is usually enough of both nutrients available to the grass. The main benefits of using these mycorrhizas is associated with their ability to improve drought resistance, disease resistance and to banish pests. In golf greens, annual meadowgrass (poa annua) is not generally wanted: the finer bent and fescue grasses are those that greenkeepers wish to develop. Poa annua is one of approximately 30% of plant species that do not form mycorrhizas. If endomycorrhizas are introduced into a green containing poa annua, it is reduced whereas the fine bent and fescue grasses, which are mycorrhizal, increase.

There are some groups of plants that do not associate with mycorrhizas and others which are so weakly mycorrhizal that they might as well not be. Most members of the brassica family - broccoli, brussels sprouts, cabbage and cauliflower - fall into this category. We also understand azaleas and rhododendrons are not mycorrhizal.

Examples of Plants which are Ectotrophic

Aspen, beech, birch, chestnut, fir, hemlock, hickory, larch, oak, ash, pine, poplar, spruce.

Examples of Plants which are Endotrophic

Agapanthus, apple, almond, apricot, ash, artichoke, asparagus, avocado, bamboo, banana, basil, bean, begonia, bent, blackberry, bulbs (all), cactus, camellia, carrot, ceanothus, celery, cherry, chrysanthemum, citrus (all), cornus, cucumber, currant, elm, fern, fescue, fig, forsythia, fuchsia, gardenia, garlic, geranium, ginkgo, grapes, grass, hawthorn, hibiscus, holly, hornbeam, horse chestnut, impatiens, juniper, leek, lettuce, lily, magnolia, maples (all), marigold, melon, mimosa, morning glory, mulberry, nasturtium, onion, palms (all), pampas grass, passion fruit, pea, peach, pear, pepper, plum, poinsettia, potato, poplar, raspberry, rose, ryegrass, squash (all), strawberry, sunflower, sycamore, tobacco, tomato, walnut, wheat, yucca

Examples of Plants which are both Ectotrophic and Endotrophic.

Alder, cedar, cypress, eucalyptus, willow

Examples of Plants which are neither Ectotrophic nor Endotrophic

Plants in the following families: heathers (ericaceae), carnation (caryophyllaceae), orchid (orchidacea), protea (proteaceae), cabbage (brassica), and beet (chenopodiaceae).

Our Approach to Mycorrhizal Fungi

We have a mycorrhizal Viresco™ product that contains a mixture of 11 different mycorrhizal fungi spores along with other micro-organisms that are in our Viresco™ Foliar. Four of these mycorrhiza species are ectotrophic and the other seven are endotrophic.

We suggest that this product, called Viresco™ Mycorrhiza, is used routinely with all manner of plants except those such as heathers and orchids for which no benefit would arise. It is described later in this publication on page 20.

Many of our customers are growers of exhibition leeks. Geoffrey Swaddle's publication, "The Leek Book - Growing and Showing of Exhibition Leeks", published in 1988, has a chapter entitled "Other Ideas and What Next". In this chapter he refers to mycorrhizal fungi.



He writes:

" There are fungi which can grow on the roots of leeks. These fungi live in mutual benefit (symbiosis) with the leek. The fungi are able to spread very well in the soil exploring a greater volume of soil in a better manner than the leek roots themselves. They enable the leek to obtain more phosphate (P₂O₅) and micro-nutrients than the leek roots could without the fungi. In return the fungi receive sugars from the leek. These fungi are called Mycorrhiza (fungus-root).

Leeks (and onions) as long as they remain disease-free, grow better on the same site than if they are rotated with other vegetables. One reason for the improvement is the increase in fertility, particularly due to the build-up of organic matter. The writer has, for several years, believed that the presence of mycorrhiza has been another reason for leeks (and onions) growing better in one position than when they are moved to a new site. Recent research seems to confirm this belief.

It may be possible in the future to obtain cultures of mycorrhiza for inoculating leeks to increase their size"

Geoffrey Swaddle will undertake an analysis of trench soil on request. Leek growers can contact him on Hexham (01434) 603212.



Introduction

The two main products used for the cultivation of plants are Viresco™ Soluble, applied on to and into the soil/compost, and Viresco™ Foliar, applied to the leaf.

Viresco™ Soluble is normally used only once per season. As plants are potted up or planted out, ensure that the new growing medium receives the treatment. Where there is a tendency for disease to occur, eg fusarium in leek trenches, it is advisable to make more than one application on to the soil. In conjunction with the above, it is recommended that Viresco™ Foliar is sprayed on to the leaves every month during the growing season. Viresco™ Foliar, which contains 50% of Viresco™ Soluble, can also be used on the growing medium when the risk of disease is high.

If the grower prefers to use dry material in his composts, we supply a product called Viresco™ Dry. This contains Viresco™ Soluble powder in fine grade granular Humate Ag50.

Whilst all the Viresco™ products contain some soluble Humate, improved results occur if more Humate is used, particularly granular Humate Ag. Also, if the soil has been treated with a fungicide or disinfectant, wait until it has dissipated before applying Viresco™.

All the Viresco™ products are dry powders which keep in that form indefinitely. When they are dissolved, prior to application, it is recommended that the solution is allowed to stand for a few hours, for example overnight, before using so that the dormant micro-organisms become active. Then the prepared solution should be used within 24 hours of mixing.

VIRESCO™ SOLUBLE

This is a soluble powder which should be dissolved in water before use. It should be watered on to and then watered into all types of growing media. Use normally once per season, preferably within a Humate programme. More than one application is recommended where there is a high probability of disease occurring. The 25g pack will treat an area of 75m².

Code	Product	Pack Size
VSOG/025	Viresco™ Soluble	25g
VSOG/050	Viresco™ Soluble	50g

VIRESCO™ DRY

This is a powder which should be used by those who prefer to put dry additives into soils and other growing media. It is a mixture of Viresco™ Soluble and fine grade granular Humate Ag50. The 300g pack will treat 1.5m³ or about 150 x 2 gallon bucketfuls of growing medium. Further granular Humate should be also mixed in.

Code	Product	Pack Size
VDRG/300	Viresco™ Dry	300g

VIRESCO™ FOLIAR

This is a mixture containing 50% of Viresco™ Soluble and 50% of another microbial product designed for foliar application. It is important to use Viresco™ Foliar on leaves in addition to using Viresco™ Soluble on the soil. The two products, with added Humate, make up a total programme for continued plant health. We sell double packs (see below) of both Soluble and Foliar Viresco™ products. Use Viresco™ Foliar monthly throughout the growing season.

Viresco™ Foliar can also be used as a booster for Viresco™ Soluble on growing media when there is a high chance of disease occurring without its use.

Usage Rates

Prior to spraying, dissolve in an appropriate amount of water to give the correct coverage. The 50g pack will treat an area of 435m² of turf or equivalent area.

It is more difficult to estimate how much leaf area Viresco™ Foliar will treat when applied to plants other than fine turf. We therefore suggest that 1½g (half a level teaspoonful) of Viresco™ Foliar be dissolved in 2 litres (half a gallon) of water and the solution, after standing, be sprayed on to leaf until run-off.

Code	Product	Pack Size
VFOG/025	Viresco™ Foliar	25g
VFOG/050	Viresco™ Foliar	50g

VIRESCO™ DOUBLE PACK

Our two Viresco™ products mainly used by the gardener are the Soluble and the Foliar and it is important that these products are used together, ie the Soluble, in solution, is applied to and watered into the growing medium and the Foliar is sprayed monthly onto the plant foliage. In order to encourage the use of both these products, we are offering a double pack of these two products at a discounted price. The double pack contains 25g of Viresco™ Soluble and 25g of Viresco™ Foliar.

Code	Product	Pack Size
MP02/999	Viresco™ Soluble,	25g
	Viresco™ Foliar	25g

HUMATE & VIRESCO™ SPECIAL PACKS

We are offering special prices for two mixed packs of Humate and Viresco™ products. The larger pack, more suited to use on open ground and large numbers of pots and planters, contains 1kg of granular Humate Ag6, 500ml of liquid Humate Ls and one double pack of 25g of Viresco™ Soluble plus 25g Viresco™ Foliar. .

For people who grow only relatively small numbers of plants or only plants in small pots, eg alpines, we have put together another trial pack of the same 4 products but with smaller quantities. This pack consists of 250g of granular Humate Ag1635, 250ml of liquid Humate Ls, and a double pack of Viresco™ containing 10g of Viresco™ Soluble and 25g of Viresco™ Foliar.

Code	Product	Pack Size
MP03/999	Humate Ag6	1kg
	Humate Ls	500ml
	Viresco™ Soluble	25g
	Viresco™ Foliar	25g
MP04/999	Humate Ag1635	250g
	Humate Ls	250ml
	Viresco™ Soluble	10g
	Viresco™ Foliar	25g

VIRESCO™ MYCORRHIZA

This product is a modified Viresco™ Foliar. It contains the micro-organisms that are in Viresco™ Foliar with a further 11 mycorrhizal fungi species added. These include 7 endotrophic and 4 ectotrophic types. Viresco™ Mycorrhiza is sprayed on to both the leaves and the growing medium surface. The solution should be washed into the growing medium but only lightly washed off the foliage. It is also recommended that an appropriately sized pinch of dry Viresco™ Mycorrhiza should also be mixed in amongst plant roots as they are potted on or planted out. If watered on, the 25g pack will treat about 150 square metres of growing medium area.

Code	Product	Pack Size
VMYG/025	Viresco™ Mycorrhiza	25g
VMYG/050	Viresco™ Mycorrhiza	50g

VIRESCO™ COMPOSTER G

This product contains micro-organism species that break down cellulose plus fine grade granular Humate Ag50. The 1kg pack will break down about 5m³ of garden waste. Thus 200g will treat 1m³ and on the basis of a heap being one metre square, sprinkle the Composter on the heap at a rate of about 30g (1 ounce) per each 15cm (6") layer of waste.

Code	Product	Pack Size
VCGK/010	Viresco™ Composter G	1kg

VIRESCO™ HYDROPONICS

We sell a micro-organism product specially formulated for use in hydroponics by the trade. In the 1997 season, one tomato nursery growing 450,000 plants under about 34 acres of glass bought a large quantity of this product. It was mainly used at 1 part per million in the nutrient solution. The nursery continued to use it and was able to say that the crop was "fungicide free".

There is an increasing interest amongst amateur growers to grow certain crops hydroponically. We are now providing this same micro-organism product bulked-up with soluble powder Humate As. The 50g pack will treat 1000 litres of nutrient solution.

Code	Product	Pack Size
VHYG/050	Viresco™ Hydroponics	50g

LIQUID CALCIUM

This product was introduced during 1997 and was featured in an article on celery in the 17th/23rd September 1997 issue of "Garden News". There can be a requirement in many plants for increased calcium and a number of symptoms are indicative of a calcium shortage. These include heart rot in celery, leaf tip browning in orchids and other plants, blossom-end rot in tomatoes and heat stress on turf. Our Liquid Calcium is used primarily as a foliar spray for take-up of calcium into the leaf. It is a fully organically chelated liquid calcium compound (trihydroxyglutarate complex). As well as being used as a foliar feed, it can be used to increase the pH of low pH soils and to reduce the pH of high pH soils. The usage rate for foliar treatment is one application at 15 to 30ml per 100m² and then 5 to 10ml per 100m² at 3 to 4 weekly intervals.

Code	Product	Pack Size
LCAM/250	Liquid Calcium	250ml

LIQUID NITROGEN

Our Liquid Nitrogen feed has an N:P:K of 28:0:0 w/w in which about 70% of the nitrogen is in a slow release form. Typically one application will last 8 to 12 weeks. It can be used both as a foliar feed and as a soil feed. When used as a foliar spray, the leaves take on an attractive, darker, shiny, waxy appearance. It is thus ideal for foliage plants.

A good number of exhibition leek growers are now using it, but only as a foliar, right through to the end of the season. Whilst it improves the colour and gives a nice sheen to the flags, there are reports that it also discourages such leaf pests as thrip from attacking the flags. This may be because the darker colour repels pests.

Liquid Nitrogen is extremely safe to use on young and delicate leaf tissues and rarely causes scorch. It is generally used at about 2% solution, ie 200ml in 10 litres (2 gallons) for plants grown outside. For greenhouse subjects, use at 1% solution, ie 100ml per 10 litres, at sufficient volume to thoroughly wet the leaves and the top 1 to 2 cm of soil/compost.

Code	Product	Pack Size
LNIM/500	Liquid Nitrogen	500ml

LIQUID POTASSIUM

Liquid Potassium has an N:P:K of 0:0:28 and it also contains 12½% liquid Humate. The quality raw materials in the formulation produce not only a fully homogenised solution but a chelated solution resulting in the following features and benefits:

- 90% available to the plant
- stable at extremely high and low temperatures
- long shelf life
- non-toxic
- no chlorine salts or heavy metals
- no fluoride impurities

Liquid Potassium is an environmentally safe premium liquid nutrient. It can be used on both soils and foliage. It is ideal for bringing out improvements in flower colour and size. With the Humate content, root density is increased. It is ideal for hardening stems towards the end of the season, eg for bonsai and exhibition flowers in general.

At an end of season show in the North East in 1999, two previous customers bought more of the product. One, who had bought his first bottle only about 5 weeks previously, won the prize for the best vase of carnations in the show. As a result of using Liquid Potassium, it was the first year for a long time that he had no need to wire up the stems. The second customer, who had been our first ever customer for Liquid Potassium, is a dahlia grower. He won prizes with a number of vases but also won a bronze medal for one of his exhibits, which he attributed to its use.

Code	Product	Pack Size
LPOM/250	Liquid Potassium	250ml

MICROMIX Micro-Nutrient Liquid

Micromix is a liquid micro-nutrient fertiliser used to correct deficiencies of certain micro-elements. It is also used to maintain levels of these micro-nutrients. Micromix contains magnesium, manganese, copper, iron and zinc as well as a small amount of nitrogen. It is in a base of liquid Humate. The Humate, acting as a natural chelator, improves the uptake of the micro-nutrients into plants. The analysis is total nitrogen 1.75%, magnesium 1.50%, manganese 1.87%, iron 3.75%, copper 0.37% and zinc 0.75%. The humic acid content, derived from our Humate, is 3.14%.

Code	Product	Pack Size
MIMM/250	Micromix	250ml



SOLUBLE SEAWEED

Our Soluble Seaweed powder contains extracts from three different types of seaweed – sargassum, ascophyllum nodosum and laminaria. Sargassum is rich in alginic acid and in cytokinins. Alginic acid gives improved water retention whereas cytokinins are growth hormones. Laminaria contains a good proportion of a compound called laminaria polysaccharide. This ingredient is an anti-viral compound. Ascophyllum nodosum has a high content of minerals and over 80 different trace elements.

The benefits obtained when our Soluble Seaweed is used are:

- The replacement of missing trace elements and nutrients.
- Improved root and leaf growth in all types of plants along with improved fruit set.
- An increase in yields of vegetables, fruits and flowers coupled with enhancement of their quality.
- The promotion of new leaf and root growth.

Usage rates

Soluble Seaweed powder, appropriately dissolved in water, can be applied as a foliar treatment, to the growing medium and as a seed soak. Usage rates are as follows: Foliar spray – 1g (1 teaspoonful) in 2 litres of water and spray leaf until run off. Apply weekly during the growing season.

Irrigation – 10g (10 teaspoonsful) per 10 litres (2 gallons) in a watering can. Apply the 10 litres of solution to approximately 50 square metres. Repeat 2 or 3 times per season.

Seed soaking – Dilute 2g (2 teaspoonsful) per 1 litre water. Place seeds in a tray and spray until half the seeds are submerged. Leave for 5 to 8 hours, depending on the thickness of the seed coat.

Code	Product	Pack Size
SESG/250	Soluble Seaweed	250g

RAPE SEED MEAL

There is a requirement for certain growers, eg bonsai enthusiasts, for slow release organic fertilisers. One of these is rape seed meal which has an approximate N:P:K of 5.9: 2.2:1.5.

Code	Product	Pack Size
RAPK/100	Rape Seed Meal	10kg

FRITTED TRACE ELEMENTS

Fritted trace elements are glass-based powders with specific mineral nutrients formulated into them. Because they dissolve slowly, the nutrients are not flushed out rapidly by rain or irrigation water. Using these products is a very good way of adding micronutrients to soils and other growing media. The resultant residue, once the nutrients have been exhausted, is silica, in effect, sand particles.

We currently have available three different formulations of fritted trace elements. The percentage micronutrient contents of the three grades are shown in the table below:

	FTE 1 (%)	FTE 2 (%)	FTE 3 (%)
Boron (B)	1.0	1.25 – 1.75	< 1
Zinc (Zn)	4.0 – 4.8	3.5 – 4.5	2.5 – 2.8
Potassium (K)			24 – 26
Iron (Fe)	12.5 – 15.2	12 – 15	11 – 13
Manganese (Mn)	4.8 – 5.9	4.5 – 5.5	3 – 4
Copper (Cu)	3.9 – 4.7	2.5 – 3.5	2 – 3
Molybdenum (Mo)	1.0 – 1.3	1.3 – 1.7	1 – 1.2

The trace element contents of FTE 1 and FTE 2 are fairly similar. However, FTE 2 gives a faster release of the micro-nutrients. Both grades can be used for bedding plants, chrysanthemums, poinsettias, vegetables, tomatoes and pot plants.

FTE 3 contains potassium as well as the six trace elements. It should be used as an addition to peat and other growing media as well as on a wide range of crops.

The recommended usage rates for FTE 1 and FTE 3 are 350g per cubic metre of growing medium. For FTE2, the rate is 175g per cubic metre.

Code	Product	Pack Size
FT1G/350	Fritted Trace Elements No 1	350g
FT2G/350	Fritted Trace Elements No 2	350g
FT3G/350	Fritted Trace Elements No 3	350g

OTHER PRODUCTS



AMINO ACIDS

For many years, it has been known that the presence of amino acids in growing media and on foliage will enhance the ability of the plant to take up nutrients. Trials work has demonstrated that when appropriate amino acids are applied, increases in yields of up to 40% in fruit and vegetables can be achieved.

In addition to the synthesis of protein and the resistance to stress, another aspect arising from the use of amino acids is the synthesis of chlorophyll with the resultant increased photosynthesis of carbohydrates. This shows as a more intense green colour in the plant. Amino acids also assist in the opening and closing of stomata (pores) on leaves.

Amino acids also have a chelating effect in plants. When applied with micronutrients, the absorption and transportation of these micronutrients is easier.

Certain amino acids are essential substances for pollination and fruit ripening. They also help with the stabilisation of the cell walls of soil micro-flora that in turn are required for the mineralisation of soil organic matter and for the production of good soil structure.

Our amino acids solution is recommended for application at a dilution rate of 2ml in one litre of water as a foliar spray. For application to soils, 5ml should be mixed in 1 litre of water. Use as a foliar treatment or soil drench once a fortnight when plants are growing strongly. Otherwise, apply monthly.

Code	Product	Pack Size
AMIM/100	Amino Acids	100ml
AMIM/250	Amino Acids	250ml

AQUA-AID

Liquid Wetter and Spreader

Aqua-Aid liquid is a non-toxic, non-ionic, biodegradable, water-based formulation of wetting agents and surfactants. Aqua-Aid reduces water surface tension, provides a uniform moisture profile, reduces water usage, increases nutrient uptake, increases water penetration and helps leach harmful salts. Its water based formulation allows application at any time of the year and it is used both as a wetting agent for soils and composts and also as a spreader when, say, foliar feeds are used. Many growers use domestic washing-up liquids as spreaders but this is not advisable as some of these materials can damage the

natural waxy surface layers of leaves. Aqua-Aid has no detrimental effect on plant life.

Code	Product	Pack Size
AQAM/100	Aqua-Aid Liquid	100ml
AQAM/250	Aqua-Aid Liquid	250ml

AQUATEN

Aquaten is a relatively new form of water holding material for use in composts. It is not like the water holding polyacrylamide crystals that have been around for many years. Aquaten is a cellulose based polymer product which locks on to organic fibres in growing media. When water is applied to a mix containing Aquaten, a hydrophilic (water loving) film is formed on the compost particles and this film promotes water absorption and retention without affecting the air filled porosity of the compost. Aquaten saves water, reduces watering frequency, improves re-wettability of composts and improves plant growth. Use at 1 to 2 grams per litre of compost. It will last about a year in compost.

Code	Product	Pack Size
AQTG/120	Aquaten	3 x 40g
AQTG/250	Aquaten	250g

AQUIFER

Liquid Wetter

This product is widely used, both in the UK and in the USA, as a wetting agent on golf greens. It is designed for turf and should be used by the amateur gardener on lawns. It is described as an omni-directional soil surfactant which means it produces both a downward and a lateral movement of applied irrigation and rain water in soils. This provides a uniform moisture profile throughout the soil for up to 45 days. This allows not only water but also chemicals and nutrients to be distributed throughout the root zone resulting in less summer stress, reduced wilt, fewer localised dry spots and improved wetting capability. It is ideal for use on domestic lawns which suffer from thatch and dry areas, as well as on flower borders and vegetable plots where it will "even out" the water that is contained in the soil. The 500ml bottle will treat 400 square metres of turf.

Code	Product	Pack Size
AQFM/500	Aquifer Liquid	500ml

CHITOSAN

Growth Promoter and Health Food

Chitosan is a natural product that is prepared from chitin. Chitin is found in the exo-skeletons of shellfish. Chitin is insoluble in water and general organic solvents. However, Chitosan is soluble in various organic acids. It protects and strengthens the living cell-wall structure.

Chitosan offers a natural alternative to the use of chemical products that are sometimes harmful to humans and their environment. Chitosan triggers the defensive mechanisms in plants, stimulates growth and promotes enzyme production.

Composition:

Chitosan Complex = 2.6% Wt/Vol
 N, P₂O₅, K₂O: 12%
 Appearance: Light yellow liquid
 pH: 4-5

Usage rates

Foliar Spraying: Dilution rate 1.5ml per litre (1:600). Spray on to leaves. Apply once per week for 3 weeks and then once per month thereafter.

Root Watering: Dilution rate 1ml per litre (1:1000). Water onto the roots. Apply once per week for 3 weeks and then once per month thereafter.

Code	Product	Pack Size
CHIM/250	Chitosan	250ml

ELIXIR

Growth Stimulant

We have put together a number of our products for the gardener who likes to make dry additions to his composts and other growing media. In Elixir there are now 6 separate items. This "cocktail" contains granular Humate Ag50, Viresco™ Soluble, Viresco™ Mycorrhiza, Calcified Seaweed and Aquaten, all at the correct individual usage rates. The sixth item is fine grade Moler which is used to make up the pack to 1kg. This size pack will treat 80 litres of compost. There is virtually no N:P:K - it is about 0:0.04:0.02 - in the mixture and therefore the nutrient balance of the compost is not affected. When Elixir is used in the growing medium, it is recommended that Viresco™ Foliar is used as a spray on the foliage every month. Use Elixir and watch your plants come to life!

Code	Product	Pack Size
ELXK/010	Elixir	1kg

GIBBERELIC ACID

(Berelex Tablets)

Gibberellic acid is a naturally occurring plant growth regulator which increases cell length, resulting in increased yields in many crops. Berelex has been approved for use to increase the fruit set on pears and to increase the yield of celery and rhubarb.

We offer single 10g soluble tablets each containing 1g of gibberellic acid. The tablets can be broken into four quarters.

For celery, one quarter tablet should be dissolved in 2.5 litres of water. A wetting agent (spreader), eg our Aqua-Aid, should be added. The solution should be sprayed onto the celery foliage to achieve complete wetting. The solution should be applied about three weeks ahead of the intended harvest date. This will increase the head size and yield of the celery plant.

Code	Product	Pack Size
BERU/001	Berelex 10g	1 Tab.
BERU/002	Berelex 10g	2 Tab.

**READ THE LABEL BEFORE YOU USE.
 USE PESTICIDES SAFELY**

MOLER

Moler is a calcined montmorillonite/diatomite granule. The calcining process has hardened the granules and created very good absorption properties. Water is stored in numerous small holes and capillaries, holding it for gradual take up by plant roots. Moler, packed in 30 litre bags, is used as an additive to composts and has shown very good results with alpines, bonsai and cacti. It is also useful as a propagating medium.

Moler is available in three grades: Fine 0.5-1mm, Standard 1-3mm and Coarse 3-6mm.

Code	Product	Pack Size
MOFL/300	Fine	30 litres
MOSL/300	Stand	30 litres
MOCL/300	Coarse	30 litres

PEROXYGRO M

Oxygen Releasing Additive

Peroxygro M is a magnesium peroxide, available both as a granular and a powder. Mixed with growing media, it increases root zone oxygen availability. When water touches the material, oxygen is gradually released. This can take place over many weeks – up to, say, 5 months. A major benefit is the alleviation of waterlogging. Peat based composts, in particular, compact over time and can cause waterlogging. Plants become stressed under these

OTHER PRODUCTS



conditions but this stress can be removed by the gradual release of oxygen amongst the roots.

Peroxygro M in growing media will maintain and protect healthy roots, allow better movement of oxygen and nutrients, and improve plants ability to absorb water and nutrients.

Improved growth and yields occur when Peroxygro M powder is mixed into growing media. It will also delay the onset of senescence in crops such as potatoes, i.e. it will lengthen the growing season.

Peroxygro M powder can be used as a seed coating. It will speed up germination and increase the germination percentage. It can also give improved yields.

Peroxygro M will help with soil remediation. Natural or inoculated micro-organisms will break down organic toxins in contaminated soils aerobically. Peroxygro will produce oxygen that will supplement the rate limiting oxygen requirement of these aerobic micro-organisms.

The recommended usage rate is about 40g per 10 litres (1½ oz per 2 gallons) of compost.

Code	Product	Pack Size
PMPG/250	Peroxygro M powder	250g
PMGG/250	Peroxygro M granular	250g

pH Test Kit

This is a simple-to-use contact strip method. If your soil or other growing media is damp from rain, simply press the end of strip against the soil and read off the colour key. If the soil is dry, moisten with a few drops of de-ionised or distilled water. The strips, provided in packs of 10, will read from pH2 up to pH9.

It is important to ensure plants are grown in media with the correct pH range. With pH7 defined as neutral, pH levels less than 7 are acidic and greater than 7 are alkaline. Most vegetables and garden flowers require slightly acidic to slightly alkaline conditions, eg pH5.5 to pH7.5. Examples are beet pH6.5 to 7.5, onion pH5.8 to 7.0, tomato pH5.5 to 7.5, cabbage pH6.0 to 7.5, carnation pH6.5 to 7.0, chrysanthemum pH6.0 to 7.5, begonia pH5.5 to 7.5, geranium pH6.0 to 8.0. Examples of plants that require more acidic conditions are azalea pH4.5 to 5.0, camellia pH4.5 to 5.5, magnolia pH5.0 to 6.0 and rhododendron pH4.5 to 6.0.

Code	Product	Pack Size
PHTU/010	pH Test Kit	10 Strips

SUPA-OXYGRO

Oxygenating Liquid for Growing Media

This liquid product contains a high proportion of available oxygen in a stable form. Tapwater can contain typically,

say, 8 parts per million of oxygen. In comparison, our Supa-Oxygro oxygen-releasing agent has available 400ppm of oxygen. It should be diluted and then applied to growing media where it will give a number of benefits. In undiluted form it acts as a biocide.

Supa-Oxygro contains a proprietary blend of calcium nitrate, potassium nitrate and ammonium nitrate. In solution, these products form nitrate ions which provide an oxidant source for aerobic bacteria. It rapidly changes anaerobic conditions to aerobic conditions.

It has a threefold effect – on soils and other growing media, on soil microbiology and on plants. It opens up compacted soils by altering the bonding of the soil particles that cause compaction. As a result, the numbers of micropores increase, thus allowing improved water and nutrient flow through the soil profile.

In soils and other growing media there can be large numbers of beneficial fungi and bacteria that are important in the cultivation of plants. Some of the fungi are called mycorrhiza and they form symbiotic relationships with plants in their root zone. Their presence increases the ability of plants to take up certain nutrients resulting in improved plant growth. Supa-Oxygro dramatically increases the number of mycorrhizal fungi in the soil by providing them with large amounts of oxygen. We advise using Supa-Oxygro in conjunction with our Viresco™Mycorrhiza.

Usage rates:

Add 5ml (1 tsp) to 5 litres (appx 1 gallon) of water and apply to 5 square metres of lawn or ground surface area. For mixing into growing media, dilute 4ml of product into sufficient water to treat 1 cubic metre of media.

Code	Product	Pack Size
SUPM/250	Supa-Oxygro	250ml

TRANSMIN

This is an anti-transpirant. The diluted product is sprayed on plant leaves where it partially blocks the stomata or pores. The use of Transmin reduces the water loss from plants. It should be used when transporting or transplanting, especially bare rooted subjects or cuttings, in the winter on evergreens and on plants near the sea to reduce salt spray damage. It can increase the yields of certain vegetables, eg potatoes and onions, when applied towards the end of the growing season.

Code	Product	Pack Size
TRAM/500	Transmin	500ml

FEEDBACK FROM WORLD LEEK & ONION CHAMPIONSHIPS, ASHINGTON

INTRODUCTION

On some of the previous pages, examples of the benefits that can be achieved using our products in horticultural applications are mentioned. These apply particularly to the use of our Humate and Viresco™ products. This section describes some of the comments and feed-back we received when attending the annual World Leek & Onion Championships over recent years at the Northern Social Club at Ashington, Northumberland. This show no longer takes place.



Alan Davison, who won the 2004 three pot leeks, has been a user of many of our products for a number of years. He also grows other vegetables and flowers to exhibition standard and specialises in dahlias. The volume of Alan's leeks was exceeded by four other exhibits but his leeks were marked up by the judge for their quality.

John Pearson of Hetton-le-Hole won the prize in 2002 and 2003 and second prize in 2007. The volume of his leeks in 2002 was 537.82 cubic inches, which was a new world record that still stands. John also has been using our products for a number of years.

Winners and volumes are:

2000	Les Waugh	491.51 cubic inches
2001	Chris Tinkler	475.62
2002	John Pearson	537.82
2003	John Pearson	516.60
2004	Alan Davison	452.15
2005	Mark Arnott	503.79
2006	Chris Tinkler	488.70
2007	John Adcock	528.54

Terry Nyczaj, a regular user of our Humate, took first prize at the National Pot Leek Society Show in 2004.

BACKGROUND

At the show, entries were three pot leeks and single onions. The leeks are judged for volume and quality. The onions are "as dug" and judged on weight. The first prize for the pot leeks was £1,300 and the first prize for the onion was £1,000.

POT LEEKS

For six out of the eight years 2000 to 2007, the winners of the £1300 prize for the three pot leeks exhibit have all been users of our granular Humate (plus other of our products as well). In 2004, the 2nd and 3rd prize winners also used our Humate. In 2005, the winner had not used our granular Humate but is a user of other of our products. However, the second and third prize-winners were users of our granular Humate. In 2007, seven out of the first eleven exhibits were users of our Humate.

HEAVIEST ONION

Before his untimely death in early 2006, John Sifford, another user of our granular Humate, had the second largest onion at the Ashington Championships in 2005 but had won the large onion prize at the Harrogate Autumn Show with an onion that weighed a world record 16lb 8³/₈oz. Regularly, many exhibits in the heaviest onion class at Ashington are grown using our products.





Alan Davison, a long-term Viresco user, and his prizewinning leeks, onions and dahlias.



John Hamilton, a Begonia grower from Lanarkshire with his prize-winning blooms at 2010 Ayr Show. John says: "... this year I found plants grew away quicker in sterilised compost. This I believe was due to the use of Viresco™ Dry. The root system established quickly and this improved the plants in the early stages. I have used humate previously but the Humate you supplied required less of the product and reduced the need for additional fertilisers. The overall quality of all my plants has been very good."

GROWERS OF EXHIBITION LEEKS

For many years we have been selling certain of our products to exhibitors of blanch and pot leeks. We have attended many Shows in the North East since 1994 and have built up a large number of customers who regularly come back for more. The first products these exhibitors took were granular and liquid Humate and then, once we introduced the Viresco™ products, these became used as routine. The four basic products used by these exhibitors are:

**Humate Ag (granular) &
Humate Ls (liquid)
Viresco™ Soluble &
Viresco™ Foliar**

(Note that these four products, which are offered in a single special pack on page 20, are those we would recommend in general for all types of growing.)

Two other products are regularly used by growers of exhibition leeks. These are:

**Viresco™ Mycorrhiza
Liquid Nitrogen**

Each of the above mentioned products are described in detail in the relevant sections of this catalogue. In addition, please note some of the feed-back items on the back cover relate to the growing of exhibition leeks.

Four relatively new products are being taken up by exhibition leek growers:

**Amino Acids
Fulvic Acid
Humate Rejuvenator
Peroxygro M**

Rejuvenator is Humate with added organic fertilisers and Peroxygro M is an oxygen releasing granule for growing media.



FEEDBACK REGARDING THE USE OF HUMATES AND VIRESCO™ IN HORTICULTURE

FRITILLARIA KEELING-OVER DISEASE

A feature in the Autumn 1998 issue of the Newsletter of the Fritillaria Section of the Alpine Garden Society, written by a user of Viresco™, showed that fritillaria keeling-over disease could be prevented by using Viresco™ microbial products. He had previously limited success with fungicides.

GLADIOLI

A breeder of gladiolus used Humate and Viresco™ for the first time in spring 1997. At the end of August 97 he wrote to say "growth and results this year in all my plantings that have had Humate and Viresco™ treatment have been remarkable and I have not used any insecticide or fungicide whatsoever."

AFRICAN VIOLETS

A nurseryman, growing African Violets, has used Humate in his mixes since Feb. 1996. He has cut down his growing time from 12 to 10 weeks and improved the colour of his plants.

CARNATIONS

The judge at the 1996 Hull Carnation Show wrote to us and said "One exhibitor had outstanding carnations with good strong stems and excellent flowers. ... He tells me that he used Humate and Viresco™ which he obtained from you."

MAGNOLIAS, CAMELLIAS AND RHODODENDRONS

One grower in 1995 wrote "I would like you to know the remarkable success I have had using Humates. In particular, I have never had growth like it in camellias and one hybrid rhododendron has put on two years growth in one season, ie. it now has two sets of buds for next Spring. A young magnolia, having one flower last year, has grown nine branches 4 ft 6 in long and is covered with fat buds whilst the same size plant I gave to my son-in-law is still 3 feet high with no buds. Mine is 5 ft "

TOMATOES GROWN HYDROPONICALLY

Viresco™ Hydroponics contains a microbial product. This product was being used at one tomato nursery which grew about 450,000 tomato plants under 34 acres of glass. They stopped using fungicide! Unfortunately, ownership of the nursery changed as did the crop grown and the method of growing. They no longer use our product.

FUCHSIAS

The President of one regional Fuchsia Society used Humate and Viresco™ for the first time in 1996. She has said that her plants had never been better as a result of using these products.

GATESHEAD SUMMER SHOW 1999

At the Gateshead Show, exhibitors who are users of our Humate and Viresco™ products won awards in the following categories: 2 pot leeks - 1st prize; 2 intermediate leeks - 1st prize; 2 blanch leeks - 1st and 2nd prizes; 3 different leeks -

1st, 2nd and 3rd prizes; 2 onions - 1st prize; collection of 6 vegetables - 1st and 2nd prizes and "Best in Show"; collection of 9 vegetables - 2nd prize; collection of 4 vegetables - 1st and 4th prizes; 4 white/4 coloured potatoes - 2nd prize; 4 white potatoes - 1st and 4th prizes; 4 coloured potatoes - 4th prize; 2 onions - 1st prize; 2 celery - 1st prize; truss of tomatoes - 1st and 2nd prizes; 6 tomatoes - 2nd prize; 6 broad beans - 2nd prize; 6 peas - 3rd prize; 2 long carrots - 1st prize; 2 stump carrots - 1st and 3rd prizes; 2 long beet - 1st and 4th prizes; 2 parsnips - 2nd prize; sweet peas - 6 first prizes, 2 second prizes and 1 third prize.

LOCAL SHOW WINNER

One north east customer, having used both Humates and Viresco™ during 1996, put numerous flowers and vegetables into his local club show. Out of 186 available points, he took 174 points! He put his success down to using Humates and Viresco™.

MICROBIAL COUNTS

AND ROOT BIOMASS ON GOLF GREENS

In tests carried out on golf green turf, root biomass was shown to go up by about 29% in the space of 2 months, with no change in the control. Bacterial counts went up by 99% whilst in the control plots they went down by about 9%!

HANGING BASKETS

In September 1995, we met one of our first customers for Viresco™. In June of that year he started to use the Viresco™ Soluble and Viresco™ Foliar in his hanging baskets. He had been trying to win his local 12" hanging basket competition for years but had never succeeded. That year, he took the first two places and put it down to using Viresco™.

EXHIBITION LEEKS USING NO FUNGICIDE

Most exhibition leek growers use a winter disinfectant to clean up their leek trenches before planting out in the spring. This is to kill-off any micro-organisms, eg fusarium, which might show up later as a disease in the plants. We now have a number of exhibition leek growers who no longer use a winter fungicide treatment, preferring to rely only on Humate and Viresco™ to keep disease at bay.



Acid: Any compound that reacts with a base to form a salt. An acid turns blue litmus paper red and is sour to the taste. It has a pH of less than 7.0. An acid produces free hydrogen ions.

Aeration: Soil aeration means the exchange of air in the soil with that in the atmosphere. Air in well aerated soil is similar to that in the atmosphere. In badly aerated soil, the air contains less oxygen and more carbon dioxide than in the atmosphere.

Aerobic: An aerobic micro-organism is one which requires free oxygen to exist or to grow.

Alkaline: A basic reaction where the pH level is above 7.0.

Anaerobic: An anaerobic micro-organism is one that does not require free oxygen to exist or grow.

Anion: A negatively charged ion

Base: Any compound that can react with an acid to form a salt. It removes hydrogen ions from an acid and combines with them. A base has a pH greater than 7 and turns red litmus paper blue.

Cation: A positively charged ion.

Cation Exchange (CEC): The process in which cations are exchanged between a solution and an insoluble solid. Our Humate has a very high CEC.

Fulvate: A salt of fulvic acid.

Fulvic Acid: Fulvic acid is that part of a humic substance that is soluble under all pH conditions. It dissolves in water or alkaline solution to form a clear orange solution. Fulvic acid is also soluble in methyl alcohol.

The proportion of fulvic acid in a humic substance is important. The higher it is, the more reactive the substance is. The amounts of fulvic acid present in leonardite sourced material is usually relatively small, ie less than 2%. Our Humate contains between 20 and 25% fulvic acid..

Structurally, fulvic acid and humic acid are similar molecularly. However, fulvic acid is usually treated as a monomer, whilst humic acid is the polymer.

Humate: A salt of humic acid.

Humic Acid: The fraction of a humic substance that is not soluble in water under acidic conditions but is soluble in water under alkaline conditions. (see Fulvic Acid above)

Humic Acids: The collective name for acid radicals found in humic substances by alkaline extraction.

Humic Substances: Heterogeneous mixtures of naturally occurring organic materials. They are generally classified into humic acid, fulvic acid and humin on the basis of their solubility in water and as a function of pH.

Humin: The fraction of a humic substance that is not soluble in water at any pH value..

Humus: Is the organic portion of soil, consisting of partially and wholly decayed plant and animal matter. It consists of both humic and non-humic material.

Ion: An electrically charged atom or group of atoms formed by the loss or gain of one or more electrons

Ion Exchange: The process in which ions are exchanged between a solution and an insoluble solid.

Leonardite: A partially oxidised form of lignite. It normally has a relatively high humic acid content (usually around 30 to 40%). Compare this to our Humate at around 75%.

Lignite: A soft brown coal used primarily as a fuel

Microbe: Any microscopic organism or micro-organism.

Micro-organism: Any microscopic organism. Another name for a microbe.

Mycorrhiza: A fungus that is associated with a plant where the fungus lives within or on the outside of the roots to form a symbiotic relationship. From the Greek meaning "fungus root".

Non-Humic Substances: Relatively undecomposed organic matter which includes polysaccharides, sugars, proteins, amino acids, waxes, resins and organic acids.

Soil Organic Matter: Term used for all the organic constituents of a soil but excluding undecayed plant and animal matter. Includes all the non-humic and humic substances

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Viresco™ Mycorrhiza	25g	20
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VIRESCO (UK) LTD

Viresco (UK) Ltd
50A Market Place
Thirsk
North Yorkshire
YO7 1LH

Tel: 01845 525585
Fax: 01845 523133

E-mail: sales@viresco-uk.com

www.viresco-uk.com
