



# Spur

## Technical report



IMPORTED FROM EU



# Spur

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# PREFACE

**SONNE AGRO** is a Spanish company with more than 30 years of experience in the Agrochemical Industry. Our activity is focused on the development and selling of fertilizers and phytosanitary products worldwide.

**SONNE AGRO** products are present all over Europe, South America, North Africa and Asia by official dealers. Our catalog is needed in nowadays agriculture, therefore our products have been developed with the latest technology and following all quality regulations: bioinsecticides, biopesticides, bionematicides, bioplaguicides, biofungicides, phyto regulators, EC fertilizers, organic fertilizers, etc.

**SONNE AGRO** is concerned about the environment and as a result we develop ecological products and offer to our clients fertilizers and bioplaguicides **completely compatible with ecological agriculture and that follow international regulations.**

# PRESENTATION

SPUR is a natural bio-activator product made with amino acids gotten from the enzymatic hydrolysis.

That makes SPUR more effective than other products which come from a chemical process. It is recommendable for all kind of crops and at any time of the year, especially when the plants need an extra energy input.

PRE-FLOWERING

FRUIT SETTING

FRUIT SIZING

VEGETATIVE GROWTH

THERMAL, HYDRIC AND SALINE

Its formula makes the plant nutrient uptake be faster. It activates the microbial flora in the soil providing vitamins and other substances. The amino acids facilitate the uptake of micronutrients of micronutrients that are blocked in the soil.

SPUR is the only product in the market that incorporates O.E.S. (Immunological System Initiator) made with salicylate derivatives that boost the plant resistance to diseases.



soil



foliar



# ORIGIN

SPUR formulation, with amino acids extracted from the enzymatic hydrolysis, makes this bio-activator much more effective than any other amino acids which come from a chemical process or the ones that come from alkaline or acid hydrolysis. Its natural ingredients make a product harmless for health, although it has to be used following the guidelines. It can't be mixed with cupric, sulphur or oily products.

The hydrolysis process is made by protein enzymes acting over the Casein (a protein with great biological value). This process makes the protein soluble but without denaturing it. All the amino acids that are obtain by the hydrolysis are highly soluble and they take part in the growing process of the plants.

## SPUR OBTAINED BY ENZYMATIC SYNTHESIS

- 20 essential amino acids are obtained.
- All the amino acids are in the L-form (natural form) and are rapidly and easily absorbed by the plants.
- No cycling of Glutamates, which is important for metabolism energy.
- No destruction of Asparagine, which is involved in plant respiration.
- Tryptophan in L-form, which initiates the synthesis of auxins (growth hormones).
- Serine and theronine in L-shape.
- Rtic and glutamic acid, which are two of the most important amino acids, are available.
- Not form amides. Great biological and nutritive value.
- No presence of inorganic nitrogen (ammonium chloride).
- Low dosages.

## AMINO ACIDS OBTAINED BY ACID OR ALKALINE HYDROLYSIS

- 16-18 amino acids are obtained.
- Not all the amino acids are in the L-amino acids, some are in D-shape, which cannot be absorbed.
- Cycling of Glutamates.
- Destruction of Aspargina.
- The tryptophan is destroyed, affecting the synthesis of auxins.
- Serine and theronine are partially destroyed.
- Aspartic and glutamic acids are not in an available form for plants.
- Nitrogen amines are formed. The biological and nutritional value is severely affected.
- Inorganic nitrogen is present as ammonium chloride.



# COMPOSITION AND PHYSICO-CHEMICAL FEATURES

Amino acids are part of plants; they are the structural unit of the protein. Proteins are organic compounds that take part in DNA synthesis, hormonal and metabolic processes related to the different phenological stages of the plant as well as in the fruit development.

SPUR provides the ideal quantity of amino acids the plant needs to achieve an increase in production, to improve the quality and also avoid the negative effects of heavy metal accumulation in the soil, iron-induced chlorosis, low temperatures, etc.

The present free amino acids make that SPUR has numerous positive effects on the plant. SONARAGRO guarantees the composition and contents.



# COMPOSITION AND PHYSICO-CHEMICAL FEATURES



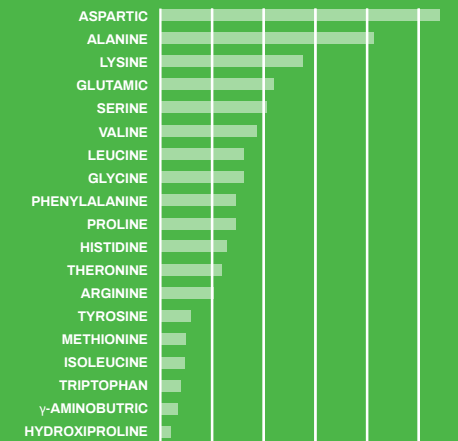
COMPOSITION	%w/w
Free aminoacids	19,4
Total Nitrogen (N)	8,0
Organic Carbon	51,0
Total Organic matter	88,0
O.E.S. (Organic Elicitor System)	3,0

PHYSICO-CHEMICAL PROPERTIES	
Description	Dark liquid
Solubility (water 25°)	100% soluble
Extract dry	44-46%
pH	6-7
Density g/L	1,26
Phytotoxic substances	absent
Stability	3 years

Free aminoacids 19,4 %			
Aspartic acid	3,09	Leucine	1,20
γ-aminobutyric acid	0,194	Lysine	1,65
Glutamic acid	1,63	Methionine	0,339
Alanine	0,78	Proline	1,03
Arginine	1,08	Serine	1,28
Phenylalanine	1,13	Tyrosine	0,41
Glycine	< 0,089	Threonine	0,84
Hydroxyproline	0,94	Tryptophan	0,199
Histidine	0,219	Valine	1,26
Isoleucine			

## OUTSTANDING IN THEIR FUNCTIONS

- **GLUTAMIC:** it is involved in the processes of growth of young leaves
- **SERINE:** it improves the resistance to the plant in stressful situations
- **ARGININE and ALANINE:** involved in the synthesis of chlorophyll
- **PROLINA:** particularly important for its anti-stress effect (water, cold, salinity, etc...)
- **TRYPTOPHAN:** intervenes in the rooting and fruit



# BENEFITS AND APPLICATION



## POSITIVE EFFECTS ON PLANTS

- Direct uptake increasing protein assimilation.
- Bio-activator for processes related with germination, development, sprouting, flowering and fruit development.
- Hormonal effects (chlorophyll absorption, IAA) improvement in sugar and vitamin levels.
- Improves foliar uptake of nutrients.



## POSITIVE EFFECTS FOR THE SOIL

- Activator of microbial flora.
- Chelating effect, helping the uptake of micronutrients.
- Improvement soil texture and ventilation.
- Activation of sugar and polyphenol uptake.
- Improves organic matter breakdown.





# BENEFITS AND APPLICATION

## OTHER POSITIVE EFFECTS OF SPUR FROST RESISTANCE

### FROST RESISTANCE

The increased protein synthesis is reflected in energy savings that the plant uses to fight against low temperatures.

### DROUGHT RESISTANCE

Some amino acids favor the water balance of the plant, increasing its resistance in times of drought.

### DECREASE OF HEAVY METAL

These metals can combine with localised compounds localised in the root zone (amino acids), decreasing the toxicity of those elements on the plant.

### DECREASE OF IRON CHLOROSIS

The chelating action of the amino acids increase the amount of iron that the plant is able to assimilate.

The application of Spur is not only beneficial for the plant but also for the soil



# BENEFITS AND APPLICATION

Iron is the fourth most common element on the earth's crust, however a lack of this element in plants is often the main cause of nutritional problems that a crop can undergo.

Iron-induced chlorosis affects plant growth and crop yield, especially for crops like tomatoes, citrus, fruit trees, etc.

Iron chlorosis manifests itself as a yellowing in the internervial spaces of the young leaves of the affected plant, due to the incapacity of the plant to synthesise chlorophyll, a molecule that contains iron in its composition.

The causes of iron chlorosis are complex, but it usually appears in sensitive crops in soils with a high pH level and with a high limestone content; under these circumstances, even though iron is abundant in the earth's crust, it precipitates in the ferric oxides form, isn't available for the plant.

The most commonly used iron-based fertilizers are synthetic chelates, that although are expensive, they are the most effective at keeping the iron soluble in the soil even when the environment is not the most favourable. Nevertheless, these chelates are only effective in the soil level are not once the iron the iron is introduced inside the plant.



# SPUR AND IRON NUTRITION



Amino acids also form chelates with iron and although they are not as stable as synthetic chelates, they have a radical effect promoting the development of absorbent hair and increasing membrane permeability, demonstrating a synergic effect in combination with iron. Furthermore, it keeps the activity inside the plant, allowing a greater movement into the leaves.

The iron inside the plant can remain still becoming part of the reserve substances (fitoferritina), and the presence of certain ions such as carbonate or nitrate, can provoke an pH level increase in the cells reducing the quantity of soluble iron. The accumulation of acid substances, such as amino acids, is a response that some plants have to decrease the cellular pH and maintain a higher quantity of soluble iron.



# SPUR AND IRON NUTRITION



SONARAGRO together with the University of Alicante, the National Agrarian University - La Molina (Lima - Peru) and The University Federico II (Naples - Italy) are developing the field of research: "The study of amino acids as synergetic action compounds with iron chelates"

ppm Fe LEMON LEAF

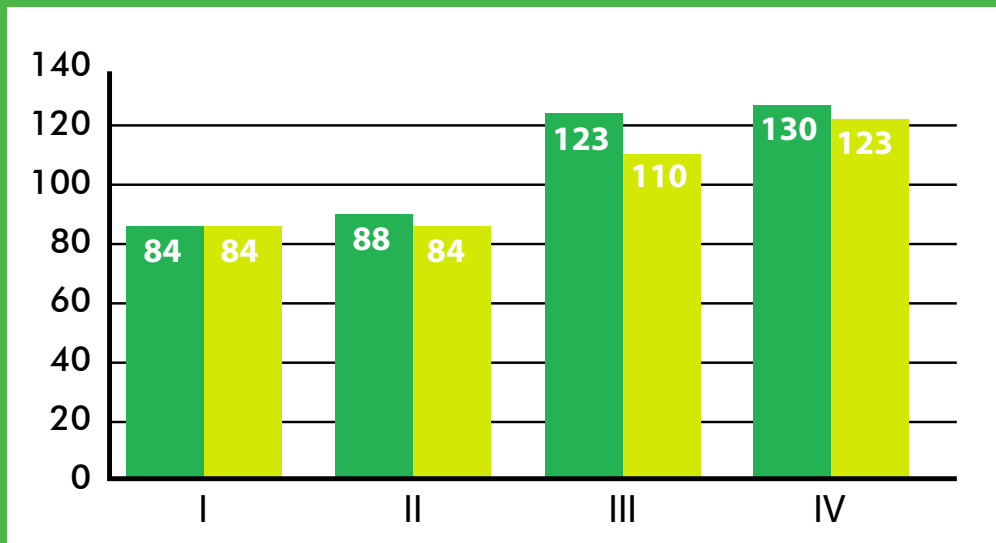


Figure 1. Sampling.

# SPUR AND IRON NUTRITION



This research is carried out in crops that are specially sensitive to iron chlorosis, such as citrus. With the application of iron chelates Fe-EDDHA along with amino acids, a higher iron concentration in the leaves is obtained, correcting the effects of the chlorosis in the plant.

## TREATMENTS

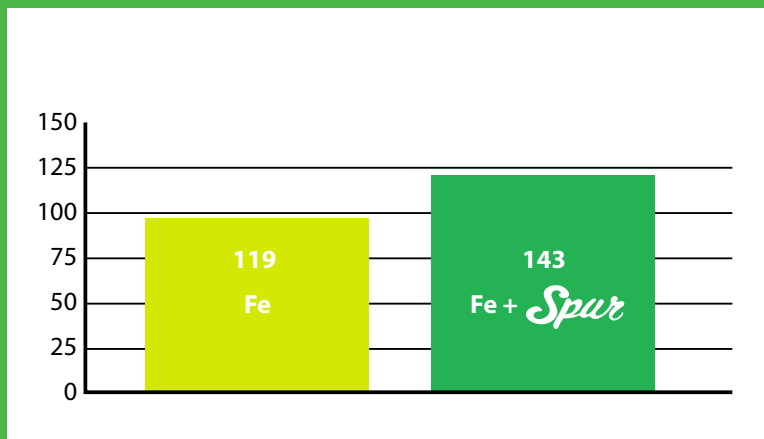


Figure 2. Average weight fruit lemon.

Figure 1. The application of synthetic iron chelates together with the amino acids is also reflected in the improvement in the fruit weight (Figure 2) or in the vitamin C content (Figure 3).

## TREATMENTS

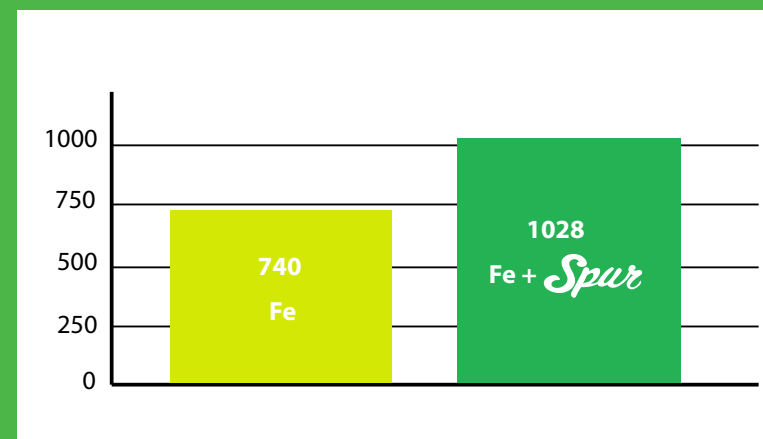



Figure 3. Vitamin C mg/100 ml. In lemon fruit.




# RECOMMENDATION OF USE BY CROPS




## VEGETABLES

	Time of application	Dose cc/100L	Benefits
	Transplantation	200	Fruit size
	Beginning of bloom	200	Vegetative development
	2 app. Every 15 days	200	Reduces effect of cold


## FRUIT TREES

	Time of application	Dose cc/100L	Benefits
	Swollen buds	200	Prevents deformation of the fruit
	Petals fall	255	Improves the action of the gibberellic acid
	Fruit sizing	300	


## STRAWBERRY

	Time of application	Dose cc/100L	Benefits
	Transplantation	200	Improvement size
	Beginning of bloom	200	Colouring of the fruit
	App. every 10 days	200	Vegetative development Reduces effect of cold


## BANANA TREE

	Time of application	Dose cc/100L	Benefits
	Applied every 15 days	250	Reduces the effects of cold, water, salt, nutritional stress

## TUBERS

	Time of application	Dose cc/100L	Benefits
	App. every 15 days	250	Favors rooted Vegetative development Reduces the stress of transplantation

## OLIVE


	Time of application	Dose cc/100L	Benefits
	Beginning of move	200	Greatest olive size
	Flowering	300	Greatest oil yield
	Olive	250	Greatest growing in autumn
	Autumn	200	

# RECOMMENDATION OF USE BY CROPS




foliar


## TABLE GRAPE

	Time of application	Dose cc/100L	Benefits
	Beginning of move	250	Resistance to stress
	Beginning of bloom	250	Improvement the action of chelates
	Grape	250	


## CITRUS

	Time of application	Dose cc/100L	Benefits
	Beginning of bloom	200	Stress resistance
	Fruit setting	250	Improves the action of the chelates
	Fruit sizing	300	


## VINE

	Time of application	Dose L/Ha	Benefits
	Beginning of bloom	2,0	Increase in production
	Grape	2,0	Improved sprouting and ripening


## BEET

	Time of application	Dose L/Ha	Benefits
	5-6 true leaves	2,5	Increase production
	2 app. every 15 days	2,5	Increase of sugar

## NUTS

	Time of application	Dose cc/100L	Benefits
	Swollen buds	250	Resistance to stress
	Petal fall	250	Improvement action of chelats
	Fruit sizing	250	

## COTTON


	Time of application	Dose cc/100L	Benefits
	10 days after sprouting	300	Increase production
	First flower	300	Vegetative development
	20 days after	300	

# RECOMMENDATION OF USE BY CROPS




foliar

## LUCERNE

	Time of application	Dose L/Ha	Benefits
	After each cut with more than 10 cm of height	2,5	Increase production


## STRAWBERRY

	Time of application	Dose L/Ha	Benefits
	Transplantation	4	Better rooted
	Beginning of flowering	4	More flowers
	Apply every 10 days	4	Improvement the action of chelates




soil


## ORNAMENTAL

	Time of application	Dose cc/100L	Benefits
	Transplantation	200	Resistance to stress
	Apply every 15 days	200	Improvement action of chelates


## FRUIT TREES

	Time of application	Dose L/Ha	Benefits
	Swollen buds	6	Increase production
	Falling petals	6	Best bud
	Fruit sizing	6	Reduces effects of stress

## LAWN

	Time of application	Dose cc/100L	Benefits
	After sowing	3-5 (L/Ha)	Favors implementation
	Beginning of flowering	300	Resistance to stress
	Apply every 10 days	200	Improvement action of chelates

## BANANA TREE


	Time of application	Dose L/Ha	Benefits
	Every 15 days between March and June	6	Reduces the effects of water, saline, cold and nutrition stress




# RECOMMENDATION OF USE BY CROPS




## OLIVE

	Time of application	Dose L/Ha	Benefits
	Beginning of move	18	Best bud
	Flowering	18	More flowering
	Fattening olive	18	Best fertilization


## CITRUS

	Time of application	Dose L/Ha	Benefits
	Beginning of bloom	12	Stress resistance
	Fruit set	12	Improves the action of auxin and others hormones
	Fruit sizing	12	


## TABLE GRAPE

	Time of application	Dose L/Ha	Benefits
	Beginning of move	5	Increased production
	Beginning of bloom	5	Improving the sprouting
	Grape	5	Larger cluster


## COTTON

	Time of application	Dose L/Ha	Benefits
	10 days after sprouting	6	Improves the rooted
	First flower	6	Speeds up production
	20 days after	6	

## NUTS

	Time of application	Dose L/Ha	Benefits
	Swollen bud	5	Higher production
	Petal fall	5	Increased curd
	Fruit sizing	5	Invigorates the tree

## ORNAMENTAL

	Time of application	Dose L/Ha	Benefits
	To transplant	4	Improving the rooted and germination
	Apply every 15 days	4	Greater number of flowers

# I.S.I. ACTIVATOR DISEASE RESISTANCE

When a plant is infected by an organic pathogen (a producer of disease: virus, bacteria, fungus... ) the following can occur:

A. In susceptible plants. The reproduction of the pathogen is not limited, which spreads through the plant causing considerable damage, and even the death of the plant.

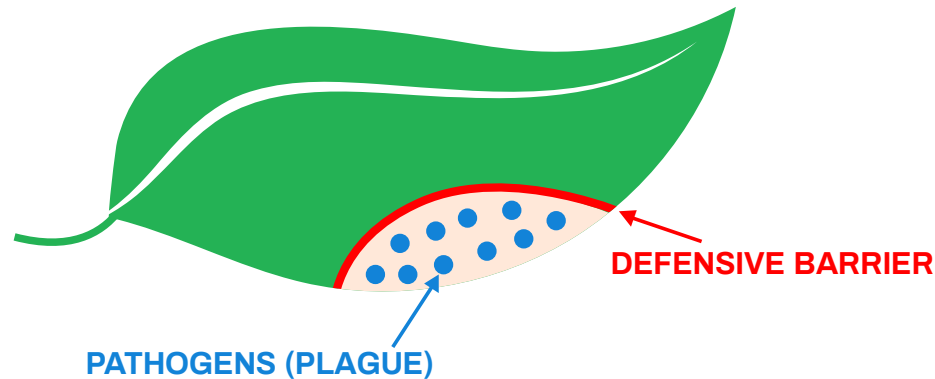
This lack of resistance can result in an incapacity of the plant to identify the infecting organism and implement successful self-defense mechanisms.

B. In resistant plants. This identifier does take place, and then put in action physiological and biochemical mechanisms which limit the spread of the pathogen to restricted zones, therefore avoiding the damage that could occur.

This process is called **HYPERSENSITIVE RESPONSE (HR)** and it is comprised of two processes:

1. Pathogen isolation to a limited zone, close to the infected area.
2. Necrosis (death) of the tissue surrounding the infected area.

## HYPERSENSITIVE RESPONSE (HR)





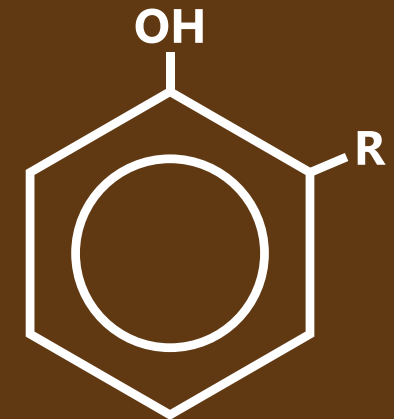
# HOW TO ACTIVATE THE PLANT'S SELF-DEFENSE MECHANISM

Current evidence, derived from multiple scientific studies (Stevenson, 1994; Bergmann, 1992; Sánchez-Andreu 2000), demonstrate that between these self-defence instigators, a group of compounds can be found, synthesised by the plants and therefore not alien to them:

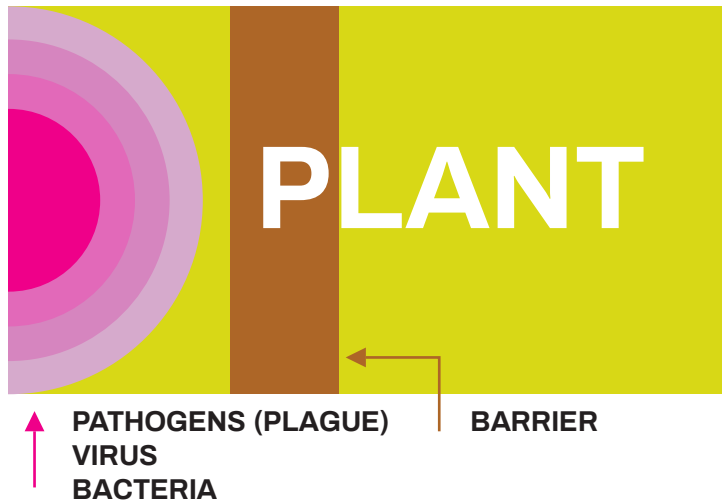
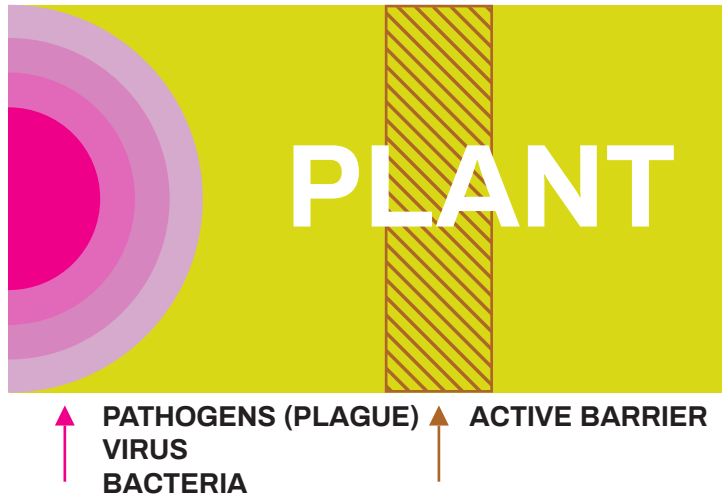
The polyphenols, little molecules made up of an aromatic ring substituted for hydroxyl groups (OH), or their derivatives.

The effects of these compounds on plants are diverse: In this way, they influence the germination, flowering, and growth of the fruit, closing of stomates and glycolysis. But

in the last few years, it has also been shown that a group of these phenolic compounds, the derivatives of salicylic acids (salicylates) are the instigators of the HR self-defence mechanism. That is to say when an infection is produced, if I.S.I. (Immunological System Initiator) salicylates are present within, these initiate a series of biochemical and physiological processes in the plant, which results in the detection, isolation and elimination of the infection.



# O.E.S. DETECTS INFECTION AND ACTIVE BARRIER



# OTHER EFFECTS OF O.E.S.

Salicylate derivatives forming part of the molecules that we have called **O.E.S.** have other benefits on the plant in addition to activate the resistance to diseases since it has an impact on the following:

## STIMULATES

Growth and plant development.  
Photosynthesis and perspiration.  
Take and transport of nutrients.

## PROTECTS

Front to ozone and ultraviolet light.

## REDUCES

Oxidative stress.  
Saline stress.  
Osmotic stress.

Based on these principles, SONAR, adds to its range of products SPUR (extract amino acids, obtained by enzymatic hydrolysis) a group of molecules registered by SONAR AGRO S.L., and called **O.E.S.**, capable of the various functions that we have just seen.

This confers SPUR an advantage additional, unique in the world market, which makes it doubly recommended.



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agro 

*Spur*