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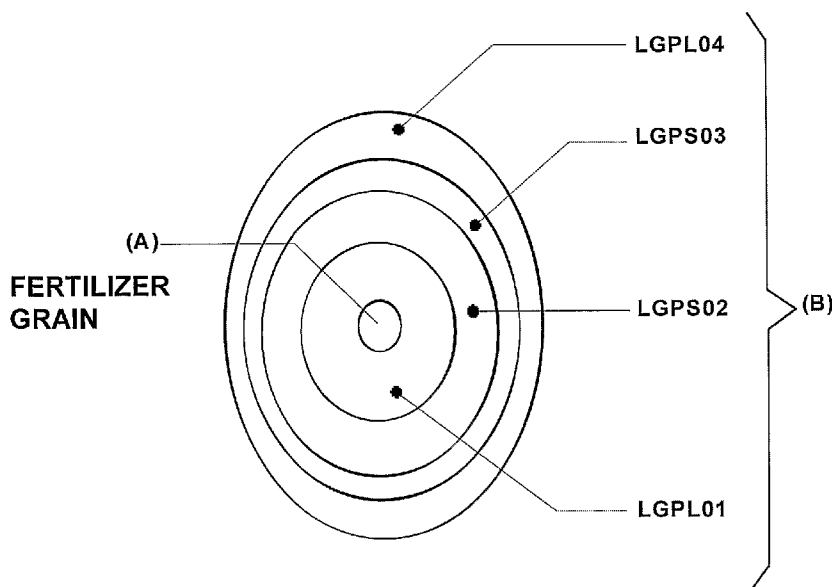
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ning of each regular issue of the PCT Gazette.

(54) Title: PROCESS TO OBTAIN GRANULE OF PHOSPHORUS WITH GRADUL RELEASE IN SOIL AND RESAULTANT
PRODUCT



(57) Abstract: In order to eliminate the phosphorus fixation by precipitation and adsorption, increasing the use of phosphorus element in agricultural cultures, comprising a set of procedures to create a particular protection over the phosphorus granule (A) which is formed by Simple Superphosphate, Triple Superphosphat or mono ammonium phosphate (A), coated with polymer layers (B). These polymer layers applied individually, where the spraying operations are cumulative, it is to say, each new polymer spraying is made over the previous condition until reaching the desired phosphorus granule (A), representing a 50%-reduction of phosphorus amount applied to soil, also reducing the losses by adsorption.

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PROCESS TO OBTAIN GRANULE OF PHOSPHORUS WITH GRADUAL RELEASE IN SOIL AND RESULTANT PRODUCT

The present claim of patent of invention is based on an original process, which makes available the gradual release of phosphorus chemical element in soil, allowing consistent economical, agricultural and ecological gains, being dedicated to agricultural fertilizer industry and commerce.

In the economical scope the petitioner obtains, with the introduction of the process of phosphorus chemical element release, the reduction of the need of applying a great amount of fertilizers in soil, being this reduction about 50%, according to data obtained from laboratory experiments and field tests, of the covered phosphorus product, with proved non-endangered farming productivity.

As a consequence of a 50%-reduction of phosphorus application, we have a proportional reduction in general costs of soil enrichment in the agricultural scope, mainly by the reduction of the raw material (phosphorus) and transportation cost for soil enrichment.

Considering the ecological scope, the application of phosphorus granules, when compared with the traditional application (spray), decreases the contamination of groundwater, as well as the reduction of soil salinization.

The above positive aspects are obtained due to the original concept of the phosphorus gradual release process, which will be named from now on as L.G.P. (Phosphorus Gradual Release).

Finally, we must consider as an advantage the reduction of the losses by adsorption due to the gradual release.

The performance of the phosphorus gradual release process is assured by an original conformation of the granule coating of Simple Superphosphate, Triple Superphosphate or MAP, whose is produced by the application of different kinds of polymers, avoiding the permanent contact of phosphorus with complexing elements of the soil to be enriched.

TECHNIQUE BACKGROUND

With the sole and exclusive intention of providing veracity to the above statement, the petitioner makes a brief, but consistent, explanation above the state-of-art of soil enrichment with phosphorus element, allowing an expert to recognize its negative aspects, and afterwards to clearly identify the requirement of novelty according to industrial property law.

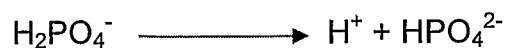
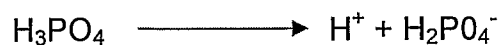
As it is known by the state-of-art, among the set of necessary macronutrients to a rich soil, phosphorus element is the required one in smaller amounts by the plants.

Although this, we verify the great need of manuring with great amount of phosphorus, being this phenomenon explained by the existence of possible areas of agricultural cultivation where is very small the availability of this nutrient.

The small availability of phosphorus in soil is added to a technical aspect: phosphorus element applied in soil strongly reacts with other preexisting elements and thus, contrarily to the other nutrients, phosphorus element assumes a particularity of being applied in great amount to get an acceptable nutritional level to the cultivable food.

This excess of manuring with phosphorus element involves a set of negative aspects of technical, economical and ecological nature.

Technically, the forms of phosphorus in soil solution depend on directly of the acidity solution, according to the dissociation reactions of H_3PO_4 :



Considering that the majority of soils present a pH value from 4 to 9, the predominant forms are $H_2PO_4^-$ and HPO_4^{2-} , and the relationship depends on the pH value of the solution. At pH value of 7.20, the

amounts are similar. Below this pH value, the most common condition on cultivated soils, the H_2PO_4^- form prevails.

At its hand the precipitation in acid soils occurs with aluminum or iron ions, present in the solution and in alkaline soils with calcium ions. Thus, during the cultivation in acid soils, the previous liming promotes the neutralization of aluminum and great part of iron, but the excessive use of limestone increases pH value above 7.0 and causes a new fixation increase, through precipitation of phosphate with calcium.

We must consider a second mechanism involved during the removal of phosphorus from solution, that is the adsorption reaction at clay surfaces, iron and aluminum hydrated-oxides or calcium carbonate, in calcareous soils.

This adsorption of phosphate occurs through a high-energy covalent link, but part of the adsorbed phosphate remains in a labile form a little while, it is to say, it may return to solution.

We must consider the occurrence of mineralogically stable phosphorus, where the removed phosphorus from solution, through precipitation or adsorption, tends to form more stable links with Al, Fe or Ca, resulting in the formation of mineralogically stable compounds.

All along the labile phosphorus becomes non-labile phosphorus, a mineralogically stable element.

There is a latter form of phosphorus in soil named organic phosphorus, which may represent between 20 and 70% of phosphorus in the cultivable layer.

The contribution of organic phosphorus will be proportional to the organic material on soil, being this basically formed by esters of orthophosphoric acid mainly represented by inositol phosphates, lipidic phosphorus, nucleic acids, nucleotides and phosphated sugars.

The basic aspects involved in the mineralization of "organic phosphorus" are practically the same of organic nitrogen, since it is necessary to consider the decomposition of the organic material as a whole.

We conclude that the forms as phosphorus

element is present in soil (mainly recognized as phosphorus fixation by precipitation and adsorption, mineralogically stable phosphorus and organic phosphorus) interfere directly in its final concentration at the cultivated product, being this fixation due to the presence of complexing elements (aluminum, iron and calcium).

Particularly, the recognized forms to fix phosphorus in soil, through precipitation or adsorption, are the responsible to retain it in soil, obligating the use of excessive amounts – it is proved the volume used exceeds about 50% of the technical index, doubling the application costs.

Also as a third negative factor, ecological scope, a great amount of phosphorus element in soil is dangerous to the environment, since it causes salinization and contamination of groundwater, being this one more critical due to privation of fresh water.

Due to the above mentioned, the petitioner has idealized, originally, the phosphorus product in a granule form of Simple Superphosphate, Triple Superphosphate or M.A.P., with the coating made by the application of different kinds of polymers, to its gradual release.

INVENTION PROPOSAL

Due to that the petitioner has developed an original process that allows gradual release of phosphorus element in soil, which completely fulfills the conditions of patentability, it is to say, it completely fulfills the requirements of novelty, inventiveness and industrial application, having as main objective to avoid fixing phosphorus through precipitation and adsorption, decreasing the contact among the aluminum, iron and calcium complexing elements, and increasing the high-phosphate ions in solution.

The above stated condition guides to the adsorption of 60% of applied phosphorus making unavailable to plants, with the polymer coating of phosphorus avoiding its fixation by soils.

The gradual release of phosphorus is due to the capability of polymers to retain macro and micronutrients inside its helical chains, releasing them gradually or when the roots enter into these chains and

adsorb such elements.

FIGURE DESCRIPTION

To complement the current description and to
5 a better understanding of the characteristics of this claim of invention, a set of
tables and drawings is presented, but not in a limited way, to explain the
claimed product.

Figure 1 shows the structure of phosphate
granule coated with polymers by a schematic way.

10 Figure 2 shows a comparison through photos
using Scanning Electron Microscopy (SEM) technique, between the simple
superphosphate granule with no polymer coating and the simple
superphosphate granule with polymer coating.

Table 1 shows the physical and chemical
15 characteristics of LVd used in the experiment to evaluate the dynamics of
phosphorus release from phosphated fertilizers using sorghum plants.

Chart 1 shows the experimental results
obtained in greenhouses, comparing the production of dry mass in the five
treatments.

20 Chart 2 shows the test results obtained in
greenhouses, comparing the general productivity in the five treatments.

Table 2 shows the physical and chemical
characteristics of LVd used in the experiment to evaluate the phosphorus
release from phosphated fertilizers to maize plants in field conditions.

25 Table 3 shows the treatments used during the
experiment to evaluate the phosphorus release from phosphated fertilizers to
maize plants in field conditions.

Chart 3 shows the results obtained of
phosphorus concentrations in leaves of maize plants collected during the
30 experiment in field conditions.

Chart 4 shows the results obtained to the
productivity of maize plants cultivated in LVd fertilized soil with different sources
of phosphorus.

EXPERIMENTAL RESULTS

The conditions of 50%-reduction of applied phosphorus, with the decrease of losses by adsorption due to phosphorus gradual release, providing to polymer-coated phosphate granule an inventive characteristic, were obtained during laboratory, greenhouses and field tests, assuring the integrity of the attributes of the claimed invention.

Laboratory Experiment

Experiment performed in experimental station with sorghum, applying in a parcel the product (polymer-coated phosphate granule) at the same dose of the blank treatment. The results have showed that the plants cultivated in vases presented a gain of dry mass of about 9.25% in the root system and 10.48% in the aerial part.

Greenhouse Experiment

The experiment was performed using sorghum plants in greenhouse, in 5-kg vases and controlled temperature ($28 \pm 5^\circ\text{C}$), at the Laboratório de Biogeoquímica do Departamento de Tecnologia da Faculdade de Ciências Agrárias e Veterinárias da Universidade Estadual Paulista, Jaboticabal Campus.

The test-plant was the sorghum grain bearing, 822 hybrid of Down AgroScience and the soil was the dystrophic Red Latosoil (LVd), former Dark red Latosoil, with its physical and chemical characteristics showed on Table 1.

The experiment was casual with 5 treatments and 3 repetitions, where:

TEST – witness treatment, with no phosphorus;

SS – treatment with simple superphosphate fertilizer as phosphorus source;

MAP – treatment with mono-ammonium phosphate fertilizer as phosphorus source;

LSS – treatment with L.G.P. simple superphosphate-based fertilizer as phosphorus source;

LMAP – treatment with L.G.P. mono-ammonia phosphate-based as phosphorus source.

5 At the end of the experiment (128 days after sorghum sowing) the sorghum plants were cut close to soil and the aerial part was separated in stem+leaves and panicle with grains, which were duly washed with tap water, distilled water and deionized water and dried in an oven with air-forced circulation at 60-65°C to constant weight. The dry material was duly
10 weighed.

In the case of the panicles, the grains and rod were separately weighed. The rod was joined to the stems and leaves.

The productivity was evaluated by the dry matter production of grains, corrected to 10% of moisture.

15 We have evaluated the dry matter production at 60-65°C of roots, aerial part (stem+leaves+rod) and total (aerial part+roots).

The plant samples were analyzed related to the phosphorus content in the nitric/perchloric digestion extract.

The obtained results were submitted to
20 variance analysis and, when F-test was significant, we used Tukey-test in a 5%-level to compare treatment averages.

The obtained practical result showed that the in the case of MAP-based products the sorghum plants have produced more than one panicle per plant, which obviously have affected the grain production.
25 The effective result of the experiment may be better viewed on Chart 1, comparison of the dry matter production, and Chart 2, comparison of productivity.

The dry matter production and the productivity were affected by the treatments, originating two groups, being the most
30 productive formed by MAP and LMAP.

At the end of the experiment, the contents of extractable phosphorus by Mehlich 1 extractor differed, being the highest value observed in MAP treatment. Related to the absorbed phosphorus by the

sorghum plants, two treatments were identified, being the greatest absorption observed in the MAP and LMAP treatments.

Thus, the dry matter production and phosphorus absorption by the sorghum plants have formed the same group of fertilizers. There was no correspondence between phosphorus extracted through Mehlich 1 extractor and the absorbed by the plants, but we must remain that the phosphorus content was obtained at the end of the experiment and not at the critical moments of the element absorption, and it is possible to conclude that:

a. The larger grain productions were observed in MAP and LMAP treatments.

b. The larger phosphorus absorption was observed in MAP and LMAP treatments.

c. The polymer coating was efficient to increase the productivity of sorghum culture in greenhouse conditions.

Field Test

The experiment was performed using maize plants in field conditions at Fazenda Experimental da Faculdade de Ciências Agrárias e Veterinárias da Universidade Estadual Paulista, Jaboticabal Campus, SP.

The soil used during the experiment was a dystrophic Red Latosol (LVd), whose chemical characterization at the beginning of the experiment is presented on Table 2.

As we can see it is a medium-fertility soil, with base-saturation near to the ideal to maize culture, and it was not necessary to make the liming, being AGN 2012 hybrid maize as test plant.

The experimental outline was the causality blocks, including 10 treatments in 3 repetitions.

The tested treatments and the used doses during sowing are showed on Table 3.

The experiment has used divided areas of 35 m² (5 x 7 m), being the manuring calculated according to the soil analysis and

indications of Bulletin # 100, resulting in 30 kg N/ha (230 g urea/parcel), 70 kg P_2O_5 /ha and 50 kg K_2O /ha (300 g KCl/parcel) per groove.

At the beginning the area was grooved (0.80 m between lines) and manured with N and K doses. In the sequence there was the distribution of phosphated fertilizers according to the dose of each treatment and the maize sowing with 5-7 plants by linear meter (75,000 plants/ha).

45 days after sowing, we performed the manuring: 140 kg N/ha (1,064 g urea/parcel) and 40 kg K_2O /ha (240 g KCl/parcel).

We took soil samples 72 days after sowing, gathering 8 simple samples by parcel at 0-20 cm deep, discarding the edge (1 m from the beginning and end of each sowing line and 1 line of each lateral side of the parcel).

The simple samples were joined and homogenized to make a representative composite sample of the parcel. At the laboratory the soil samples were extended to dry directly with air at shadow, where the dry samples were passed through a 2-mm screen, obtaining the TFSA, which were stored in polyethylene bags in dry chamber until the analysis.

Foliar samples were obtained according to Malavolta et al. (1997), gathering the first opposite leave and below the first spike of ten (10) plants by parcel, 67 days after sowing.

At the laboratory we discarded the medium thirds of the leaves of each treatment, which were washed with diluted detergent solution, tap water, distilled water and deionized water.

The washed samples were stored in drilled paper bags in an air-forced circulation oven, at 60-65°C to constant weigh.

The dry samples were ground in a 40-mesh Willey-type mill and stored in polyethylene bags in a dry chamber to chemical analysis.

At the end of culture cycle, 121 days after sowing, we gathered third-line spikes, discarding the edges (1 m from the beginning and the end of the line) to evaluate the productivity of maize plants. The grains were separated from corncob and weighed, taking a sample to

moisture determination. The grain moisture was corrected to 13% (commercial grain).

The phosphorus concentrations extracted through Mehlich 1 extractor in soil samples were analyzed, and complementary total phosphorus concentrations were analyzed in the leave samples.

The obtained results were submitted to variance analysis and, when F-test was significant, we used Tukey-test in a 5%-level to compare treatment averages.

The final result of the experiment allows some definitive conclusions: related to the phosphorus concentration in the leave samples, there was no detection of deficiency of this element in any of the considered treatments, proving the polymer capacity of releasing phosphorus from the phosphated fertilizer.

Chart 3 shows the obtained results to phosphorus concentration in leave samples at the indicated time to evaluate the nutritional state of maize plants. We can see there was no significant difference among the treatments, being the phosphorus content inside the normal range considered by Malavolta et al (1997).

Related to the measured productivity we can see on Chart 4 that the grain production expressed with 13% of moisture was not affected by the treatments and varied from 3.12 and 4.82 t/ha.

The non-detection of a significant effect may be related to a relatively high VC of variation, although acceptable to field tests (VC = 20.66%).

The Brazilian production average is 1.8 t/ha and the worldwide average is 3.3, being USA the best known productivity in the state-of-art, with the value of 6.9 t/ha (Malavolta et al. 1997).

In despite of the variance analysis have not showed a significant F-value, the regression analysis showed a decrease linear trend from the higher to smaller productivity ($r_2 = 0.94$).

Considering so expressive results, we can conclude:

- a. All tested fertilizers have, in the used

dose, produced plants with phosphorus foliar content considered as adequate, and it was not detected significant difference among phosphorus source;

b. There was no harmful effects to grain productivity related to the treatments;

5 c. With the use of L.G.P. it is possible a 50%-reduction of the applied phosphorus in maize culture, with no impact to productivity.

INVENTION DETAILS

10 The following description must be read and interpreted with the showed drawings, tables and charts, which are highly illustrative and have no intention to limit the invention scope, this one only limited by the explanations of claiming frame.

According to the illustrative schemas and
15 drawings the current claim of invention patent is referred to a new "PROCESS TO OBTAIN GRANULE OF PHOSPHORUS WITH GRADUAL RELEASE (L.G.P.) IN SOIL AND RESULTANT PRODUCT" where in figure 1 was created a final structure representation obtained after phosphorus granule coating (A), formed by Simple Superphosphate (SS), Triple Superphosphate (ST) and MAP
20 with different kinds of polymers, named in this document as LGPL01, LGPS02, LGPS03 and LGPL04 respectively, whose practical result is to avoid the permanent contact of phosphorus with the complexing elements of soil.

The process of phosphorus with gradual release (L.G.P.) now claimed starts with a specially developed equipment,
25 essentially composed by five silos, whose function is to release phosphorus and its layers at the right order and time.

First of all the phosphorus granules (A) are fed at a rate of 16 kg/min. In this condition the LGPL01 polymer is sprayed at a relation of 1.5%, during 12 s/min.

30 In the sequence the byproduct formed by the granule of Simple Superphosphate (SS), Triple Superphosphate (ST) and MAP with a layer of LGPL01 polymer, receives the LGPS02 polymer, which is sprayed at a rate of 6%, during 18 s/min.

In the sequence the byproduct formed by the granule of Simple Superphosphate (SS), Triple Superphosphate (ST) and MAP with the internal layer of LGPL01 polymer and the external layer of LGPS02 polymer, receives the LGPS03 polymer, which is sprayed at a rate of 4.5%,
5 during 10.5 s/min.

Finally, in the last step of layers formation, the byproduct formed by the granule of Simple Superphosphate (SS), Triple Superphosphate (ST) and MAP with the more internal layers of LGPL01, LGPS02 and LGPS03 polymers respectively, receives the LGPL04 polymer,
10 which is sprayed at a rate of 1%, during 5 s/min.

Thus, we obtain the granule of Simple Superphosphate, Triple Superphosphate or MAP with LGPL01, LGPS02, LGPS03 and LGPL04 polymer layers. To a better comprehension of the final product figure 2 presents a photo, obtained by Scanning Electron Microscopy (SEM) technique, of the granule of Simple Superphosphate, Triple
15 Superphosphate or MAP (A).

Figure 2 presents a second photo, also obtained by Scanning Electron Microscopy (SEM) technique, where it is possible to verify the granule of Simple Superphosphate, Triple
20 Superphosphate or MAP (A), duly coated with polymer layers (B), more specifically LGPL01, LGPS02, LGPS03 and LGPL04.

From all that has been described and illustrated, it can be seen that this regards a new invention, with the presentation of phosphorus in L.G.P. condition that reduces in 50% the amount
25 of phosphorus applied to soil, reducing dramatically the losses by adsorption, due to the logic of phosphorus gradual release which completely complies with the norms that regulate the Invention Patent in the light of the Industrial Property Law, and therefore deserving respective privileges when regarding what has been exposed and its consequences.

CLAIMS

1st) "PROCESS TO OBTAIN GRANULE OF PHOSPHORUS WITH GRADUAL RELEASE (L.G.P.) IN SOIL AND RESULTANT PRODUCT", providing a 50%-reduction of phosphorus amount applied to soil, sensitively reducing the losses by adsorption, due to the gradual release of phosphorus, characterized by the L.G.P. product be formed by a phosphorus granule (A), which is duly coated by a polymer layer (B).

2nd) "PROCESS TO OBTAIN GRANULE OF PHOSPHORUS WITH GRADUAL RELEASE (L.G.P.) IN SOIL AND RESULTANT PRODUCT", in accordance with claim 1, whose phosphorus granule (A) is characterized by being formed by Simple Superphosphate, Triple Superphosphate or MAP (A).

3rd) "PROCESS TO OBTAIN GRANULE OF PHOSPHORUS WITH GRADUAL RELEASE (L.G.P.) IN SOIL AND RESULTANT PRODUCT", in accordance with claim 1, whose polymer layer (B) is characterized by being formed by LGPL01, LGPS02, LGPS03 and LGPL04 polymers, being the first one the more internal and the last one the more external.

4th) "PROCESS TO OBTAIN GRANULE OF PHOSPHORUS WITH GRADUAL RELEASE (L.G.P.) IN SOIL AND RESULTANT PRODUCT", whose obtainment process is characterized by a first step where phosphorus granules (A) are exposed in a rate of 16 kg/min in the equipment feeding, where the LGPL01 polymer is sprayed at a rate of 1.5%, during 12 s.

5th) "PROCESS TO OBTAIN GRANULE OF PHOSPHORUS WITH GRADUAL RELEASE (L.G.P.) IN SOIL AND RESULTANT PRODUCT", in accordance with claim 4 characterized by the byproduct formed by phosphorus granule (A) coated by LGPL01 polymer receiving the LGPS02 polymer, which is sprayed at a rate of 6%, during 18 s.

6th) "PROCESS TO OBTAIN GRANULE OF PHOSPHORUS WITH GRADUAL RELEASE (L.G.P.) IN SOIL AND RESULTANT PRODUCT", in accordance

with claim 5 characterized by the byproduct formed by phosphorus granules (A) coated by LGPL01 and LGPS02 polymers receiving the LGPS03 polymer, which is sprayed at a rate of 4.5%, during 10.5 s.

- 5 **7th) "PROCESS TO OBTAIN GRANULE OF PHOSPHORUS WITH GRADUAL RELEASE (L.G.P.) IN SOIL AND RESULTANT PRODUCT"**, in accordance with claim 6, whose final step is characterized by the byproduct formed by phosphorus granules (A) coated by LGPL01, LGPS02 and LGPS03 polymers, be coated by the LGPL04 polymer, which is sprayed at a rate of 1%, during 5 s.

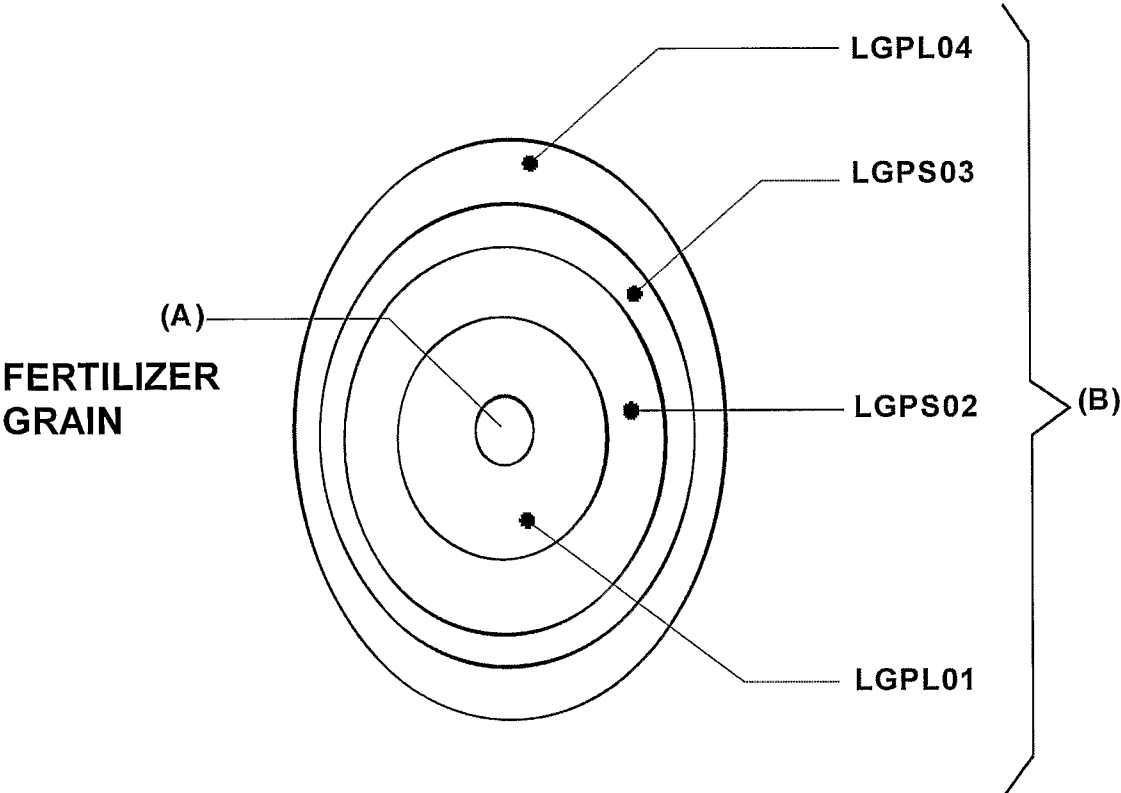
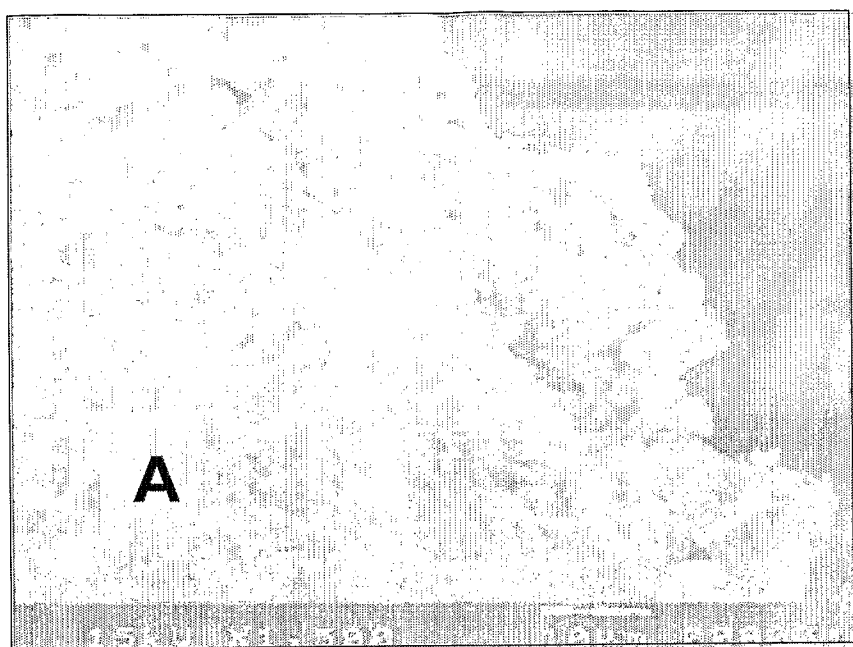
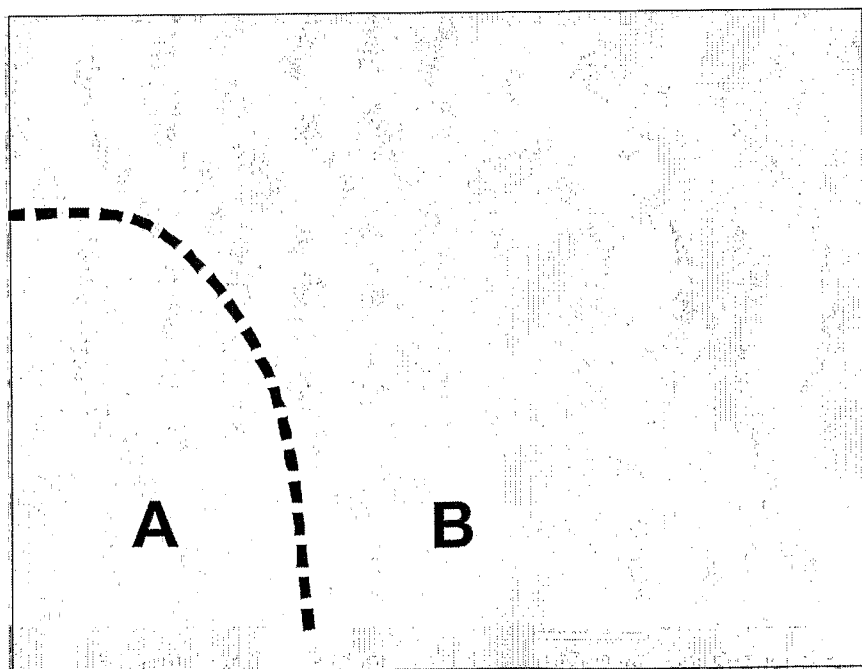


FIG-1



1



2

FIG-2

TABLE 1

pH	P	MO	K	Ca	Mg	S-	H+Al	Al	T	V
CaCl ₂	(res)	g				SO ₄				-- % -
	mg	dm ⁻³	----- mmol _c dm ⁻³ --			mg	----- mmol _c dm ⁻³ -			-
	dm ⁻³		-----			dm ⁻³	-----			
4,9 d	6,0 a	29,0	3,6	19,0	11,0	20,0	38,0	nd	71,8	47,1a
		d	d	b	d	d			b	

LEGEND:

a = very small

b = small

c = medium

d = high

e = very high

nd = non determined

TABLE 2

pH	P (res)	MO	K	Ca	Mg	H+Al	Al	T	V
CaCl ₂	mg	g dm ⁻³	----- mmol _c dm ⁻³ -----			----- mmol _c dm ⁻³ -----			-- % -
	dm ⁻³		-			-			-
5,7 b	21 c	31	1,7 c	25 d	20 d	22	nd	68,7	68 c

LEGEND:

a = very small

b = small

c = medium

d = high

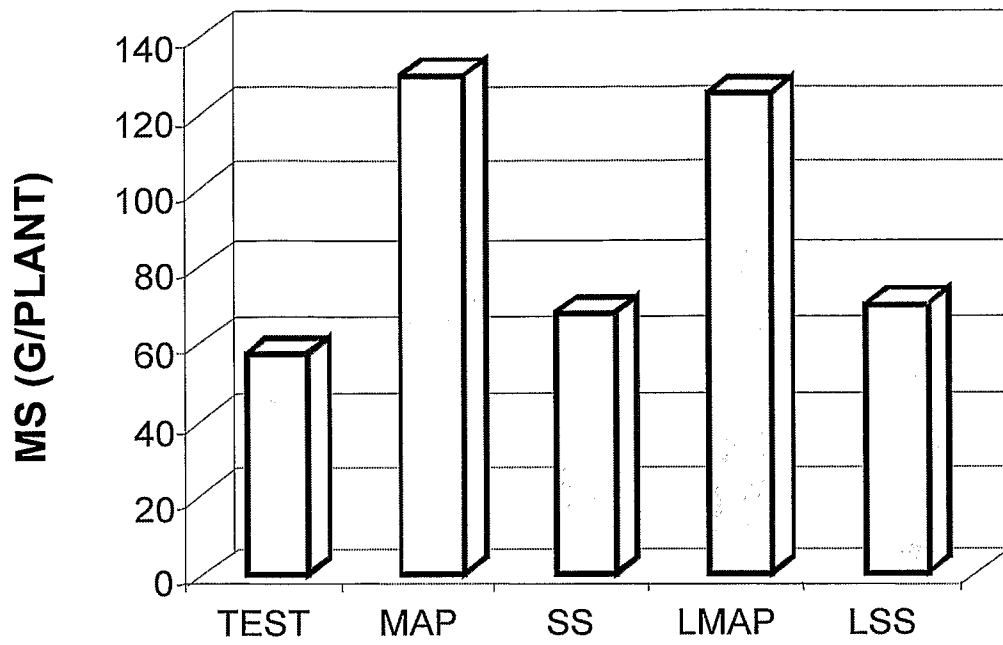
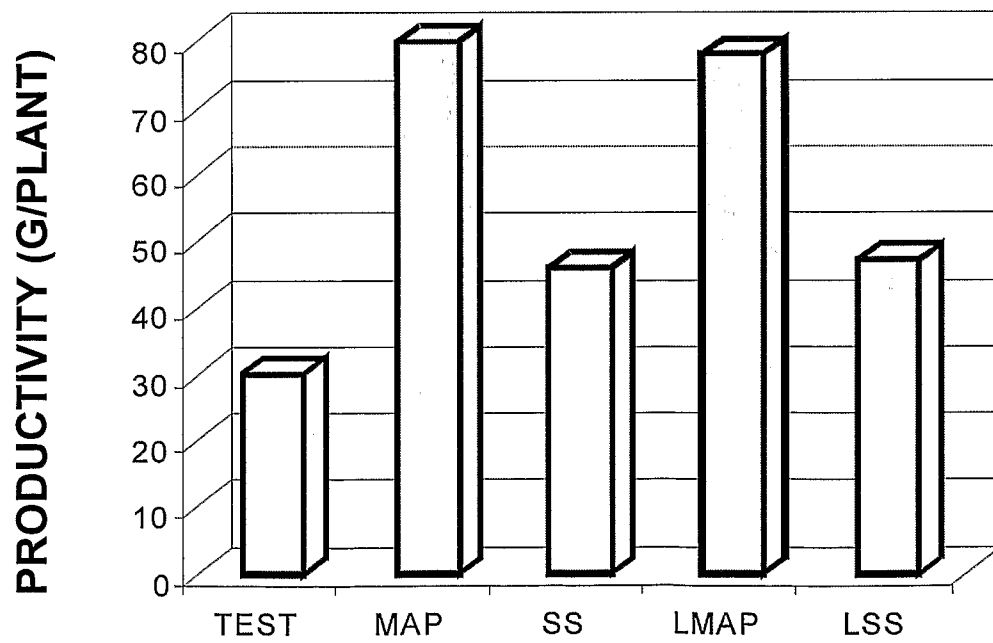
e = very high

TABLE 3

TREATMENTS	REDUCTION
SS WITNESS	0%
MAP WITNESS	0%
LGP MAP	0%
LGP MAP	25%
LGP MAP	50%
LGP MAP	75%
LGP SS	0%
LGP SS	25%
LGP SS	50%
LGP SS	75%

LEGEND:

LGP MAP = LGP MONO-AMMONIUM PHOSPHATE FERTILIZER
 LGP SS = LGP SIMPLE SUPERPHOSPHATE

**CHART 1****CHART 2**

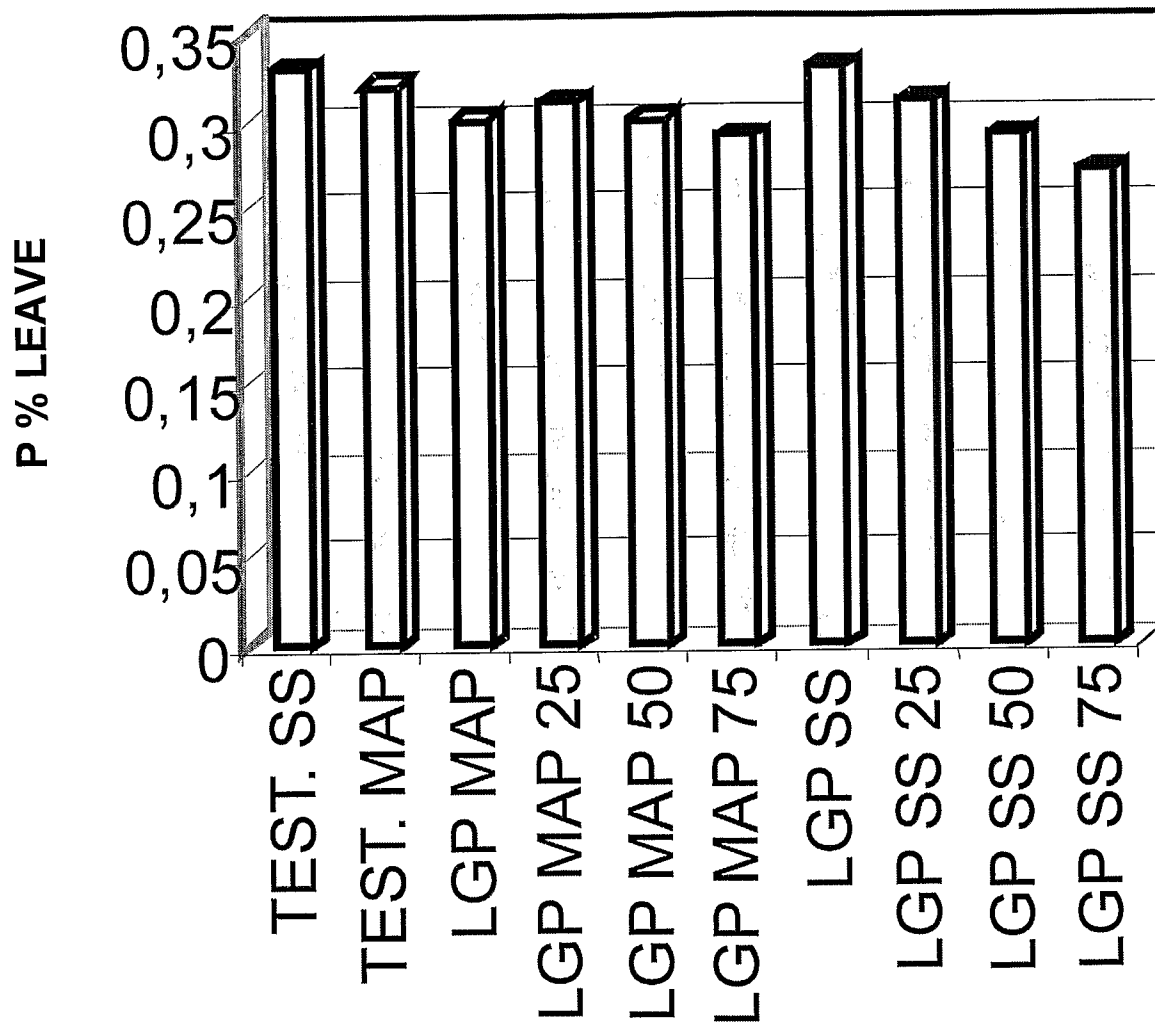


CHART 3

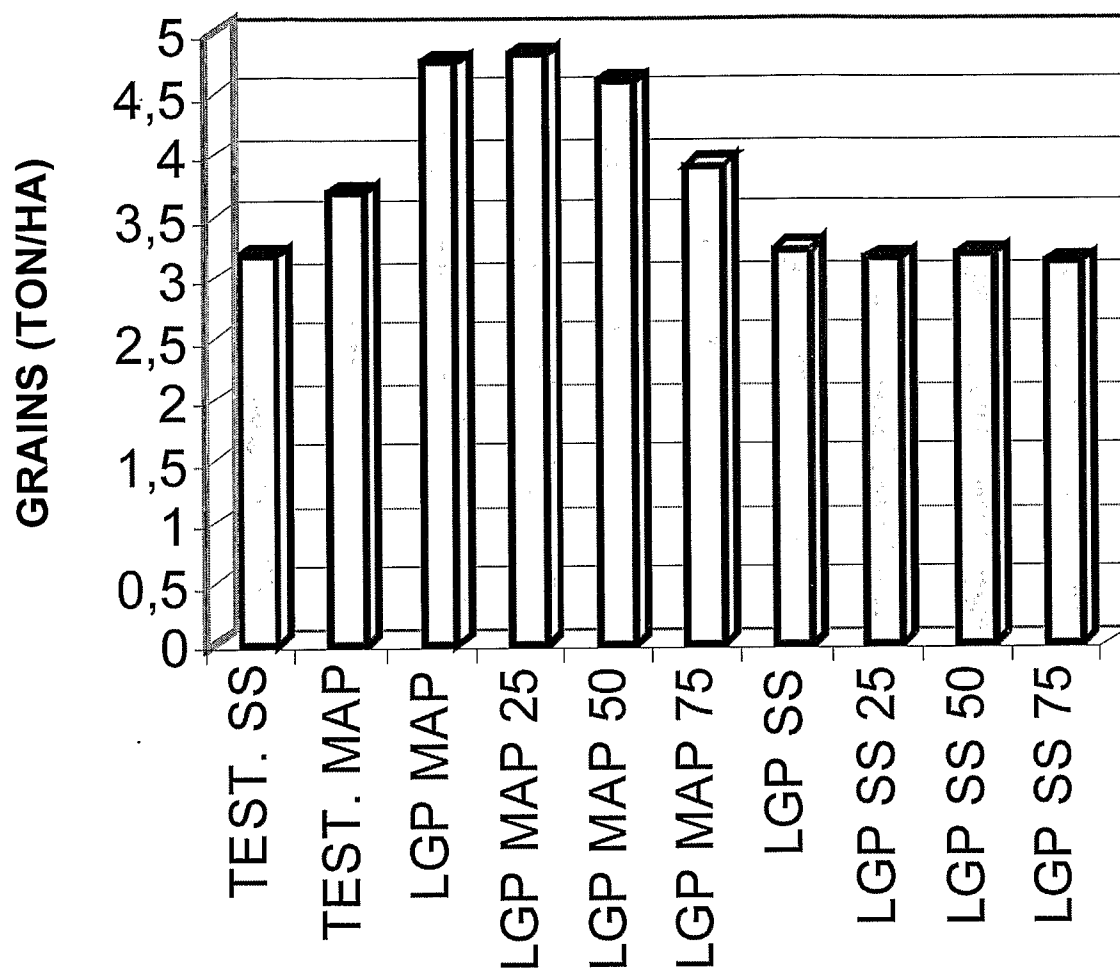


CHART 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/BR 2006/000162

A. CLASSIFICATION OF SUBJECT MATTER

IPC⁸: **C05B 19/00** (2006.01); **C05B 19/02** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC⁸: C05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPI, EPODOC, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4678710A (SAKIMOTO S. et al.), 7 July 1987 (07.07.1987) <i>Column 1, line 52 - column 2, line 12; column 5, line 7 - column 6, line 40; claims.</i>	1,2,4
Y	--- " ---	1 - 7
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X	US 5399186A (DERRAH R. et al.), 21 March 1995 (21.03.1995) <i>Column 2, line 24 - column 3, line 4; column 3, line 45 - column 5, line 38; column 8, lines 37 - 50; column 10, lines 25 -30; claims 1,9.</i>	1,2
Y	--- " ---	1 - 7
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search
3 November 2006 (03.11.2006)Date of mailing of the international search report
21 December 2006 (21.12.2006)Name and mailing address of the ISA/ AT
Austrian Patent Office
Dresdner Straße 87, A-1200 ViennaAuthorized officer
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/BR 2006/000162

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 954555A (ARCHER-DANIELS MIDLAND COMPANY), 8 April 1964 (08.04.1964) <i>Page 2, lines 57 - 81; page 7, line 52 - page 8, line 2, claims.</i>	1 - 7
Y	US 3295984A (HANSEN L.I.), 3 January 1967 (03.01.1967) <i>Column 1, lines 40 - 52; column 2, lines 52 - 71; column 3, lines 20 - 63; example VI, claims 1, 6.</i>	1 - 7
X	US 4011061A (FORSEEN R.K.), 8 March 1977 (08.03.1977) <i>Column 4, lines 5 - 17; column 8, lines 42 - 54; claims 1, 5-8, 12, 13.</i>	1, 2

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/BR 2006/000162

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