



GRUPO CURIMBABA

Phonolite as source of potash with results comparable to high water soluble potash

June 2017



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What is Ekosil

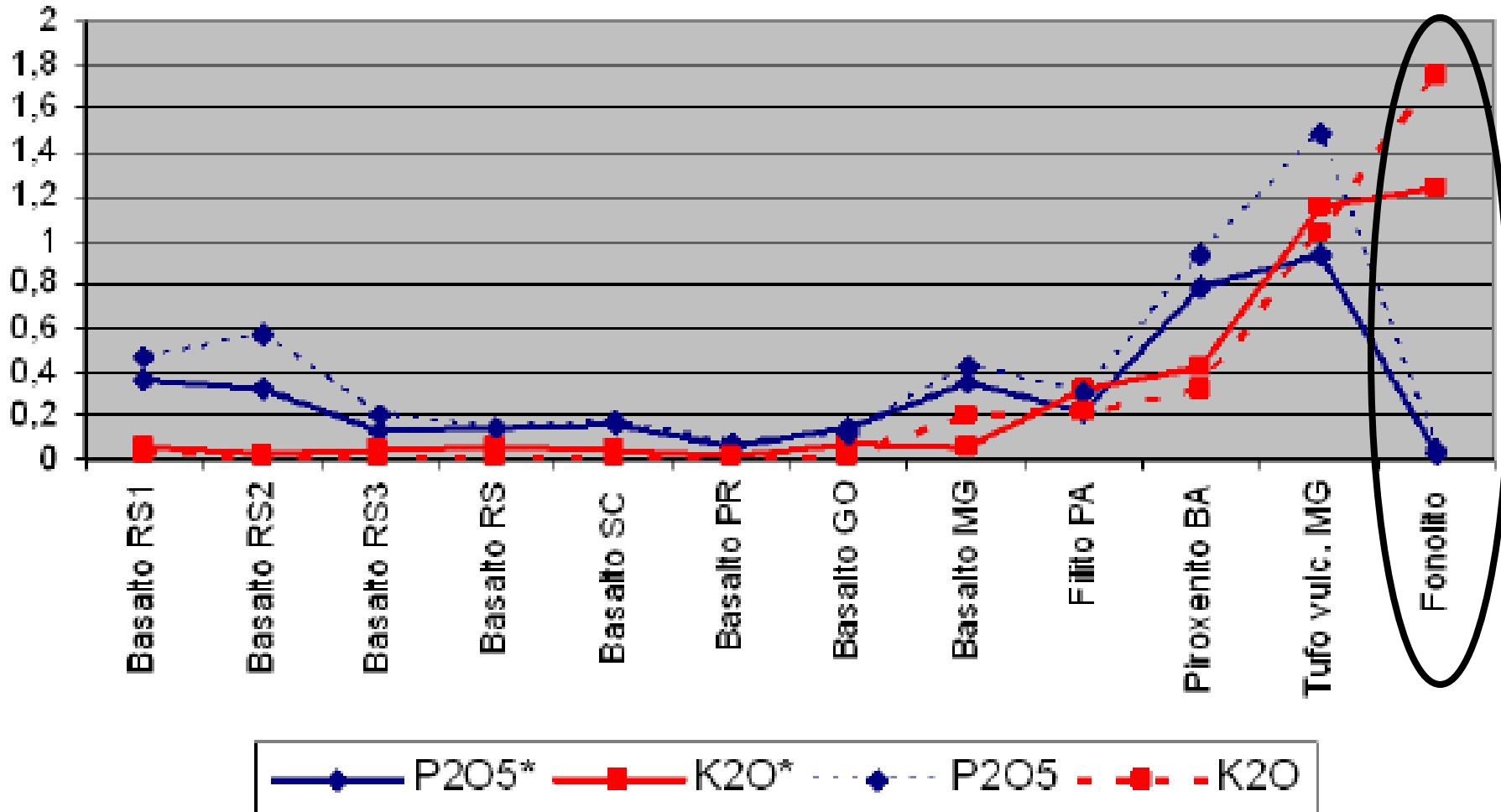
- ✓ Ekosil is the commercial name for a mineral called phonolite;
- ✓ The phonolite is a igneous rock with fine crystals which is finely milled in order to be sold as K₂O source (200 mesh size);
- ✓ The main rock that formed phonolite is a nepheline;
- ✓ All the minerals are located at Pocos de Caldas/Brazil which is one of the biggest alkaline complexes in the world;
- ✓ The chemical content of phonolite is very homogeneous.

	Main Igneous Rocks from Pocos de Caldas Alkaline Complex			
Oxides	Phonolite	Tinguaiate	Foiaiate	Sienite Nefeline
Al ₂ O ₃	23.3	21.4	21.2	26
SiO ₂	52.8	57.5	53.2	55
Fe ₂ O ₃	3.4	4.3	4.2	4
TiO ₂	0.5	0.6	1.2	1
K ₂ O	8.4	8.4	8.2	12
Na ₂ O	7	6.7	7.4	0.5
CaO	1.5	2.5	1	0.3
MnO	0.1	0.2	0.4	Traces
MgO	0.5	1	1.6	Traces



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Solubility



Extractors: 2% citric acid, nitric acid, and chloridric acid



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Main Nutrients Availability

	P2O5*	K2O*	CaO*	MgO*	P2O5	K2O	CaO	MgO	Oxides	Chemical Content%
Basalto RS1	0,36	0,06	1,16	0,9	0,46	0,03	1,09	0,52	AL ₂ O ₃	23,3
Basalto RS2	0,32	0,03	1,14	0,58	0,57	0,02	1,07	0,25	SiO ₂	52,8
Basalto RS3	0,13	0,04	1,12	0,97	0,21	0,02	0,54	0,51	Fe ₂ O ₃	3,4
Basalto RS	0,14	0,06	0,48	0,3	0,15	0,02	0,41	0,07	TiO ₂	0,5
Basalto SC	0,16	0,04	0,47	0,22	0,17	0,01	0,39	0,1	K ₂ O	8,4
Basalto PR	0,06	0,02	0,83	0,56	0,08	0,01	0,45	0,24	Na ₂ O	7,0
Basalto GO	0,15	0,07	0,67	0,91	0,11	0,01	0,38	0,15	CaO	1,5
Basalto MG	0,35	0,06	0,38	0,12	0,43	0,21	0,81	1,4	MnO	0,1
Fonolito B	0,03	1,24	0,41	0,02	0,04	1,75	0,91	0,03	MgO	0,5
Filito PA	0,22	0,32	1,96	1,53	0,31	0,22	1,1	0,9		
Piroxenito	0,79	0,43	0,87	0,81	0,94	0,32	0,8	0,7		
Tufo vulc. MG	0,93	1,16	1,9	1,85	1,49	1,04	1,7	1,06		

Extractors: 2% citric acid, nitric acid, and chloridric acid

20% soluble

60% soluble



What is Ekosil

GRUP





What is Ekosil

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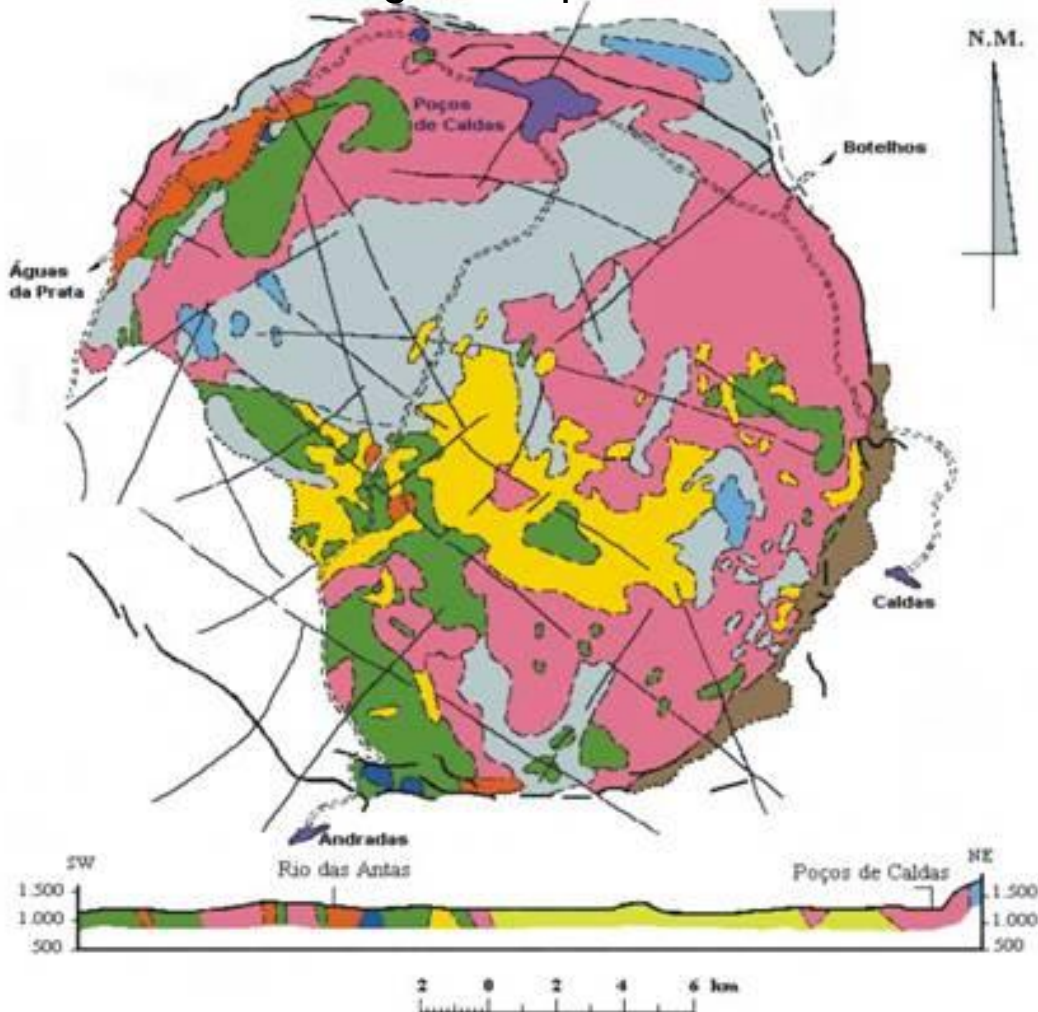




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The Geology of where the phonolite come from...

Geological Map of Pocos de Caldas



- Considering only the tinguaiates and the phonolites, there is more than 1 billion tons of this mineral;
- The reserve close of where the milling plant is, it is estimated to be over 100 million tons.

CONVENÇÕES	
	Phonolito
	Rocha Potássica
	Fosfato
	Tufos e Rocha Proclíticas
	Tinguaito
	Lignito e Chibato
	Ferro e Gnaiss
	Armatos
	Limite e Topo do Dique Antlar
	Estrada
	Limite do Levantamento Geológico
	Contato Inferido
	Falha



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Ekosil results

- ✓ The first Ekosil test was for rice, beans, corn, and soy bean at UNESP.
- ✓ The tests were using conventional KCl and Ekosil for the same amount of K₂O;
- ✓ The dosage of K₂O was 0, 1/2, 1, and 2 times the recommended dosage of K₂O for each crop;
- ✓ The dosage was applied as following:
 - ✓ Rice – 0, 20, 40, 80 Kg of K₂O per Hectare;
 - ✓ Corn – 0, 50, 100, 200 Kg per Hectare;
 - ✓ Beans – 0, 25, 50, 100 Kg per Hectare;
 - ✓ Soy Bean – 0, 25, 50, 100 Kg per Hectare.
- ✓ The Nitrogen and Phosphorous was applied for all the tests as recommended.



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Ekosil results

		Ekosil	KCI	
Dosage Kg/Ha	Crop	Yield Kg/Ha	Yield Kg/Ha	Ekosil Results
Control	Rice	1148	1148	0%
20	Rice	1377	1896	-27%
40	Rice	1908	1854	3%
80	Rice	1891	1903	-1%
Average	Rice	1581	1700	-7%

		Ekosil	KCI	
Dosage Kg/Ha	Crop	Yield Kg/Ha	Yield Kg/Ha	Ekosil Results
Control	Corn	6516	6516	0%
50	Corn	8166	7650	7%
100	Corn	8516	8346	2%
200	Corn	8620	9098	-5%
Average	Corn	7955	7903	1%

		Ekosil	KCI	
Dosage Kg/Ha	Crop	Yield Kg/Ha	Yield Kg/Ha	Ekosil Results
Control	Beans	1792	1792	0%
25	Beans	1848	1735	7%
50	Beans	1868	2165	-14%
100	Beans	2087	2240	-7%
Average	Beans	1899	1983	-4%

		Ekosil	KCI	
Dosage Kg/Ha	Crop	Yield Kg/Ha	Yield Kg/Ha	Ekosil Results
Control	Soy Bean	1723	1723	0%
25	Soy Bean	2487	2459	1%
50	Soy Bean	2570	2476	4%
100	Soy Bean	2780	2669	4%
Average	Soy Bean	2390	2332	2%

The results above encourage us to market Ekosil



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Ekosil results

- ✓ After the test at UNESP, Ekosil was tested for Coffee, Sugar Cane and Eucaliptus in the same format of the last test;
- ✓ The results are the following:

Coffee			
Dosage	Ekosil	KCl	
Kg of K ₂ O/Ha	Yield Kg/Ha	Yield Kg/Ha	Ekosil Results
Control	-	-	-
75	1255	1152	9%
150	1979	1674	18%
300	1597	1673	-5%
Average	1610,3333	1500	7%

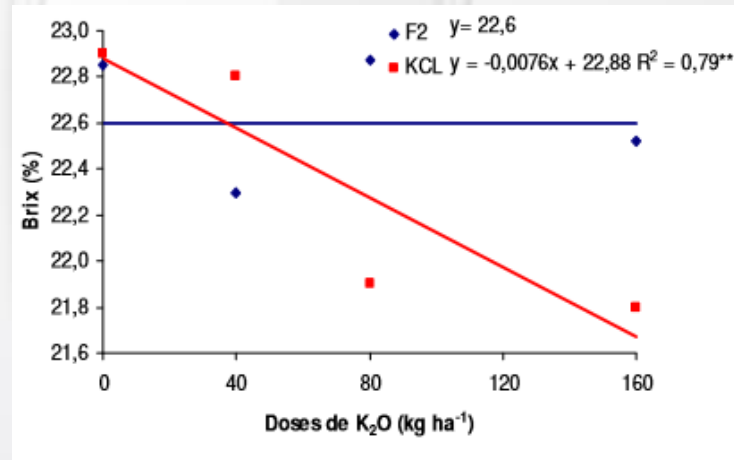
Eucaliptus			
Dosage	Ekosil	KCl	
Kg of K ₂ O/Ha	Yield Kg/Ha	Yield Kg/Ha	Ekosil Results
Control	-	-	-
40	270	330	-18%
80	339	249	36%
160	247	225	10%
Average	285,33333	268	6%



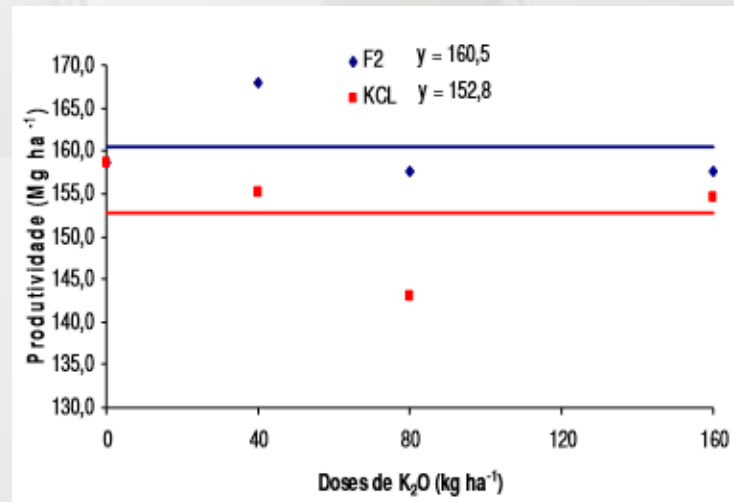
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Ekosil results

✓ The Sugar cane test had a great results in terms BRIX as the following graph:



✓ The productivity had a linear result with better performance for Ekosil:





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Ekosil results

✓ Besides the UNESP test, the following researches were done:

Research Entity	Crop	Started	Finished
Universidade Federal de Uberlandia UFU	Millet	Aug/11	Apr/11
FAZEA/ESALQ/USP	Sugar Cane	dec/11	dec/12
GETAC - Citrus	Citrus	feb/12	feb/13
EPAMIG	Coffee	jan/12	dec/12
FAZEA/USP	Pasture	feb/11	feb/13
UNESP - Registro	Banana	dec/11	dec/12
Embrapa - Cerrados	Eucaliptus	2012	2018
Embrapa - Cerrados	Pasture and Soy Bean	2012	2015
Embrapa - Cerrados	Cassava	2012	2013
IPEF - International Paper	Eucaliptus	2013	2016
Embrapa - Cerrados	Soy Bean and Corn	2012	2013
Embrapa - Cerrados/Goias	Soy Bean and Corn	2012	2013



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Ekosil results

✓ Some interesting results...

Leaching K in 30 days and 477 mm of rain		
Soil	KCl	Ekosil
Sandy Soil	84%	0%
Clay	81%	0%

Source: Gaspar Korndofer - UFU 2012

Water in the soil	Content of Si in the soil mg/dm ³		
Mpa	Limestone	Ekosil	Difference for Ekosil
0,02	2,86	3,43	20%
0,05	1,99	3,2	61%

Source: Crusciol et al. (UNESP Botucatu 2007)

Water in the soil	Production os commercial potatoes g/plant		
Mpa	Limestone	Ekosil	Difference for Ekosil
0,02	819,5	972,5	19%
0,05	737,5	830	13%

Source: Crusciol et al. (UNESP Botucatu 2007)



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Ekosil results

✓ **Some interesting results...**

Water in the soil	Si on potatoes %		
Mpa	Limestone	Ekosil	Difference for Ekosil
0,02	0,22	0,28	27%
0,05	0,22	0,24	9%

Source: Crusciol et al. (UNESP Botucatu 2007)

Available P Content in the soil mg/dm ³		
Limestone	Ekosil	Difference for Ekosil
43,88	78,44	79%

Source: Crusciol et al. (UNESP Botucatu 2007)



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SOYBEAN

Producer: Antonius Van Ass

Yoorin[®]

Variety: MG/BR-46

Planting: 30/11/2011

Harvesting: 04/05/2012

Municipality: Uberaba – MG

Agronomist: Rafael T. Ferracini



RESULTS

PRODUCT	QUANTITY	PRODUCTION
POTASSIUM CHLORIDE	150 kg/ha	3.239 kg/ha
EKOSIL (Fonolite)	1.125 kg/ha	3.539 kg/ha

9.3% of
better yield
than KCl



GRUPO CURIMBABA

SOYBEAN

Maercio Selicani

Yoorin®

Variety : SYN-V-Max RR

Planting: 30/11/2011

Harvesting: 04/05/2012

Municipality : Assis Chateaubriand - PR

Agronomist: Robson Murate



RESULTS

PRODUCT	QUANTITY	PRODUCTION
POTASSIUM CHLORIDE	104 kg/ha	1740 kg/ha
EKOSIL (Fonolite)	806 kg/ha	2228 kg/ha

28% of
better yield
than KCl



GRUPO CURIMBABA

SOYBEAN

Jeronimo Rigamonti

Variety: : BMX Apollo

Planting: 19/11/2011

Harvesting: 20/05/20124

Municipality : Braganey PR

Agronomist: Robson Murate

Yoorin[®]



Practical Results

RESULTS

O QUE USOU



02-20-20

EKOSIL (Fonolite)

QUANTO APLICOU



270 kg/ha

675 kg/ha

PRODUZIU



2,404 kg

2,447 kg

2% of better
yield than
KCI



GRUPO CURIMBABA

SOYBEAN

Jorge Patricio

Yoorin®

Variety : BMX Magna RR

Planting: 27/11/2011 Harvesting: 02/05/2012

Municipality : Mamborê - PR

Agronomist: Robson Murate



Practical Results

RESULTS

PRODUCT	QUANTITY	PRODUCTION
POTASSIUM CHLORIDE	70 kg/ha	1,988 kg/ha
Ekosil (Fonolite)	525 kg/ha	2,044 kg/ha

3% of better yield than KCI



GRUPO CURIMBABA

SOYBEAN

Producer: Edgar Paglia

Variety: CD 248 RR

Planting: 08/11/2011

Harvesting: 13/05/2012

Municipality : Ponte Serrada - SC

Agonomist: Robson Murate

Yoorin



RESULTS

PRODUCT	QUANTITY	PRODUCTION
Potassium Chloride	80 kg/ha	2,400 kg/ha
EKOSIL (Fonolite)	600 kg/ha	2,880 kg/ha

20% of
better yield
than KCl



GRUPO CURIMBABA

SOYBEAN

Producer: Eduardo Calixto

Yoorin®

Variety: Nidera 8015 RR

Planting: 08/11/2011 Harvesting: 13/05/2012

Municipality: Coromandel – MG

Agronomist: Rafael T. Ferracini



RESULTS

PRODUCT	QUANTITY	PRODUCTION
Potassium chloride	150 kg/ha	3,886 kg/ha
EKOSIL (Fonolite)	1.125 kg/ha	4,119 kg/ha

6% of better yield than KCI



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COFFEE

Producer: Jacy Miguel

Yoorin[®]

Variety: Catuai Vermelho

Application: 04/11/2011 Harvesting: 10/07/2012

Municipality: Serrania – MG

Agronomist: Ricardo Rossi



RESULTS

PRODUCT	QUANTITY	PRODUCTION
Potassium chloride	175 kg/ha	1440 kg/ha
EKOSIL (Fonolite)	1.219 kg/ha	2160 kg/ha

50% of
better yield
than KCl



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COFFEE

Producer: Haroldo Barcelos Veloso

Variety: Yellow Catuaí

Application : 11/2011

Município: Carmo do Paranaíba – MG

Agronomist: Rafael T. Ferracini

Yoorin[®]



RESULTS

PRODUCT	QUANTITY	PRODUCTION
Potassium chloride	540 kg/ha	1740 kg/ha
EKOSIL (Fonolite)	4000 kg/ha	2040 kg/ha

17% of
better yield
than KCl



GRUPO CURIMBABA

COFFEE

Sergio Luiz Dadona

Variety: Yellow Catuaí

Application : 11/2011

Município: Coromanel – MG

Agronomist: Rafael T. Ferracini

Yoorin®



RESULTS

PRODUCT	QUANTITY	PRODUCTION
Potassium Chloride	540 kg/ha	2520 kg/ha
EKOSIL (Fonolite)	2200 kg/ha	2760 kg/ha

10% of
better yield
than KCl



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CORN

Producer: Gilvan Sorna

Yoorin[®]

Variety: hibrid

Planting: 08/10/2011 Harvesting: 20/05/2012

Municipality: Uberlândia – MG

Agronomist: Rafael T. Ferracini



RESULTS

PRODUCT	QUANTITY	PRODUCTION
Potassium chloride	150 kg/ha	8760 kg/ha
EKOSIL (Fonolite)	1000 kg/ha	9120 kg/ha

4% of better yield than KCI



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Other potential findings...



- ✓ In more than 200 tests with Ekosil in comparison with KCl, 95% of the time had better results towards Ekosil;
- ✓ No other K mineral has a better solubility than Ekosil, considering only the milling treatment;
- ✓ The Si, which Yoorin has more than 52%, has also high solubility (around 11% soluble). This Si helps to prevent disease such as sigatoka disease on bananas;
- ✓ The Si also helps soils to maintain its nutrients;
- ✓ It is a form to increase soil Ph without increase nematoids;
- ✓ Because of its process, Ekosil has competitive prices;
- ✓ Due to the its performance, Ekosil sales came from virtually zero to more than 30 k tons last year;
- ✓ Potentially increase sugar on crops.



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Thanks

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