

## Technical information about the biological products line of the Company Grupo Agroenergía

### 1. Liquid Inoculants and bacterial count.

Bacterial populations are enumerated by colony forming units or what's more typically shown on product labels as CFU. Liquid inoculants for legumes and pastures contain a bacterial count greater than  $3 \times 10^9$  CFU/ml at the time of packaging, maintaining a prominent level of survival for periods ranging from 12 to 18 months depending on the bacterial strain (each crop has a specific bacteria associated with it, see **Table 1**). The minimum count is  $5 \times 10^8$ , which ensures a very high number of viable microorganisms at the expiration date of the product. The inoculants based on *Azospirillum brasilense* and *Pseudomonas fluorescens*, recognized bacteria that promote plant growth have a count of  $1 \times 10^9$  at the date of manufacture and  $1 \times 10^8$  at expiration.

BACTERIA	CROP	DOSAGE
Bradyrhizobium japonicum	Soybean	100cm <sup>3</sup> / 50 kg of seeds
Rizobium Phaseoli	Common Bean	250cm <sup>3</sup> / 50 kg of seeds
Bradyrhizobium sp.	Peanut and other legumes	200cm <sup>3</sup> / 50 kg of seed
Rhizobium leguminosarum bv. Viceae	Pea, Lentils, Faba beans	200cm <sup>3</sup> / 50 kg of seeds
Rhizobium Meliloti	Alfalfa, Melilotus spp.	250cm <sup>3</sup> / 100kg of seeds
Rhizobium leguminosarum bv. Trifolii	Clover	250cm <sup>3</sup> / 100kg of seeds
Mesorhizobium ciceri	Chickpea	100cm <sup>3</sup> / 50 kg of seeds
Bradyrhizobium lupini	Lupin	

**Table 1.** Most common crops and their associated bacterial species.

### 2. Peat based and powder inoculants.

Available in bacterial strains and treatment sizes to match any legume inoculation, the peat base inoculant is one of the most economical products on the market for obtaining nitrogen fixation. Bacterial survival varies between  $1 \times 10^{10}$  CFU/g and  $1 \times 10^9$  CFU/g after 18 months.

The powder inoculant of *Trichoderma virens* contains at least  $1 \times 10^8$  spores/g and its expiration varies between 6 and 24 months depending on storage conditions.

### 3. Frozen concentrate.

Applying new technologies in the cultivation of cells microorganisms (Bradyrhizobium and Rhizobium), our laboratories achieved cell cultures with a higher performance and better quality. This is a new support for inoculants that enables a top notch distribution method which is revolutionizing the market. The product contains approximately  $1 \times 10^{12} / 5 \times 10^{11}$  bacteria/gram and because of its high concentration, weight and volume diminish one thousand times compared to regular inoculants, making it ideal for shipping. If stored at  $-20^\circ\text{C}$  it keeps its initial count for at least 2 years. The addition of specific polymers and cryoprotectants allow to maintain this high cellular viability. This product is ideal to be used as raw material in the preparation of peat-based inoculant.

#### 4. Extender/preserver.

**Pro Noc** is a unique liquid formulation that can be mixed with inoculants when they are being applied, to enhance bacterial survival in inoculated seeds, especially when inoculants are applied together with chemicals (fungicides and/or insecticides). This product is recognized as one of the most efficient in the market and allows sowing to be scheduled up to 30 days after applying the inoculant on the seed. By adding this product to the seed treatment while using inoculants, a remarkable yield increase is obtained. We advise to supplement the Inoculant line treatment with Pro Noc to achieve even greater results:

- Protects bacteria on seeds once inoculated.
- Makes the inoculants compatible with chemical. fungicides and/or insecticides.
- Adaptable to any inoculation method.
- Seed sellers can supply already inoculated seeds.

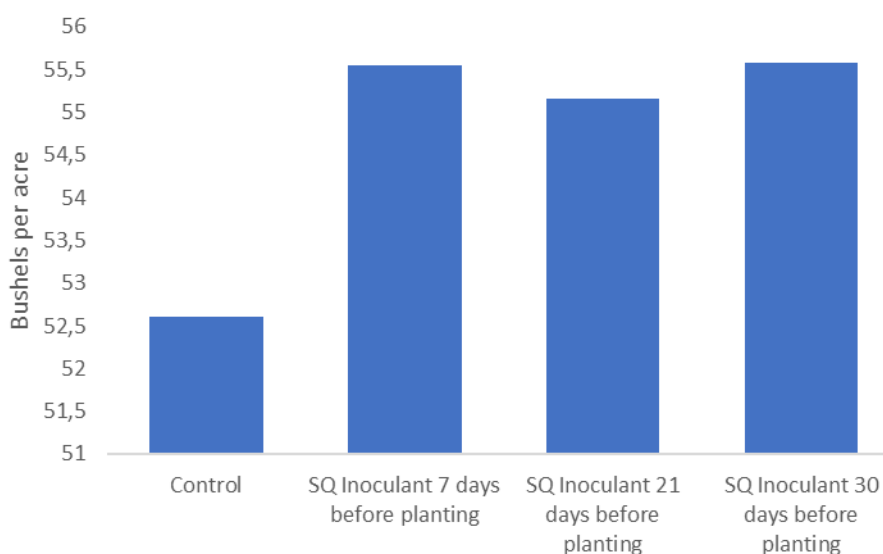
#### 5. Field trials

The results shown below represent an average of tests carried out by the company over time. For specific data of geographical locations and specific performances, do not hesitate to consult our technical service.

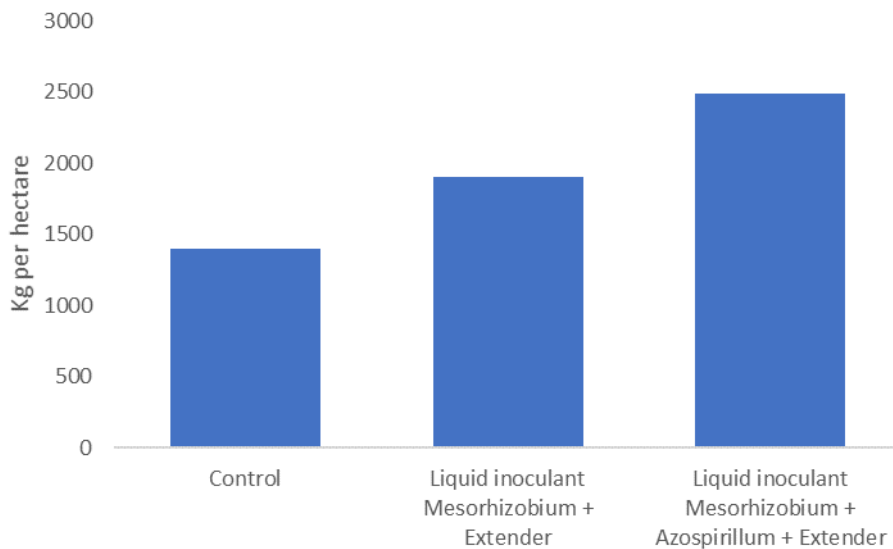
##### 5.1 Soybean (liquid inoculant)

Treatment	Average Yield (bushels per acre)	Difference (bushels per acre)	%
Control	46,97	-----	----
SQ1	54,58	7,61	<b>16%</b>
SQ2	51,43	4,46	<b>9%</b>

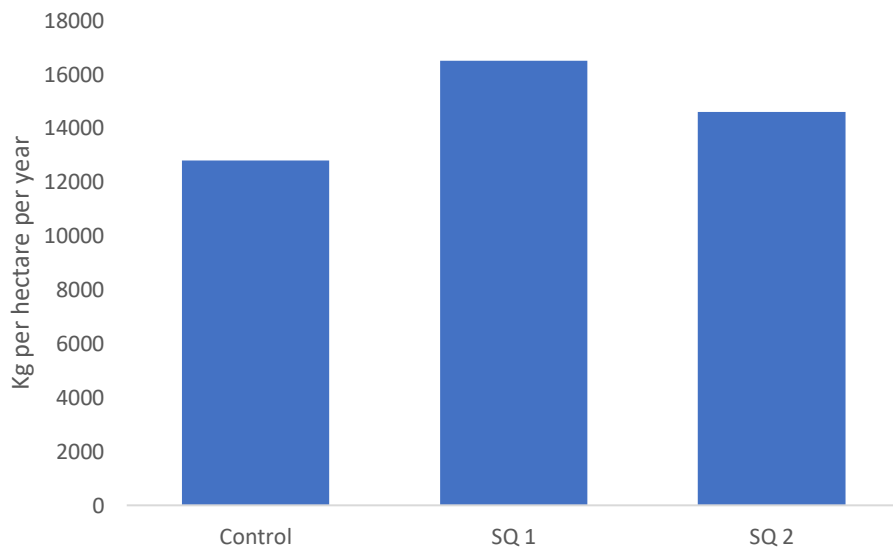
##### 5.2 Soybean (liquid inoculant+ extender)



### 5.3 Chickpea (liquid inoculant)



### 5.4 Alfalfa (liquid inoculant)



### 5.5 Other crops and inoculants.

Several decades of field trials with different crops and treatments guarantee the quality of our products. Request additional technical information that fits your specific need.

### 6. Quality Assurance.

All our products have strict quality controls both in the manufacturing process and in the monitoring of production batches. We have **ISO 9001** certification in processes and management, which allows us to be in permanent improvement, renewal and reconversion of the productive units to meet the needs of our customers.

