



NEW SCIENTIFIC STUDY OF SILICIA

The Silica Experts

SINCE 2003

EURECAT - CTNS

Relative Absorption of Organic Silica

"Comparative nutritional study of the bioavailability of three supplements rich in organic silica".



For this purpose, a randomized, crossover, double-blind, three-arm, postprandial study was performed. The study aimed to compare the bioavailability of three silica supplements (**G5 SILIPLANT**, **G7 ALOE**, **ORGONO SILICA POWDER (hereafter ORGONO POWDER)**) in volunteers. The dose of the treatments supplements was 21.6 mg of organic silica, administered in different volumes of the products according to the concentration of the commercial format to be evaluated.

The relative absorption of the silica ingredient (Si), as orthosilicic acid with maltodextrin (**Orgono Powder**), was compared with the usual liquid presentations of silica in the form of orthosilicic acid with Equisetum arvense, Rosmarinus officinalis (**G7 Siliplant**) and orthosilicic acid with aloe vera (**G7 Aloe**).



The health benefits of silica (Si) have been widely reported in recent decades¹. Both in vitro and in vivo studies indicate **that silica exerts beneficial properties on the structural integrity of nails, hair and skin and on collagen synthesis and bone mineralization**¹. Thus, oral supplementation of silica is widely used in humans to improve osteoporosis², hair loss and nail quality³.

Silica is the second most common element in the earth's crust after oxygen⁴. This mineral occurs naturally in food as silica dioxide (SiO₂) and silicates, while most of the silica in water is present as free orthosilicic acid (OSA; H₄SiO₄)⁵.

1) Martin, K. R. Silicon: The health benefits of a metalloid. Met. Ions Life Sci. 13, 451–473 (2013). 2) Spector, T. D. et al. Choline-stabilized orthosilicic acid supplementation as an adjunct to Calcium/Vitamin D3 stimulates markers of bone formation in osteopenic females: a randomized, placebo-controlled trial. BMC Musculoskelet. Disord. 9, 85 (2008). 3) Barel, A. et al. Effect of oral intake of choline-stabilized orthosilicic acid on skin, nails and hair in women with photodamaged skin. Arch. Dermatol. Res. 297, 147–153 (2005). 4) Luyckx, M., Hausman, J.-F., Lutts, S. & Guerriero, G. Silicon and Plants: Current Knowledge and Technological Perspectives. Front. Plant Sci. 8, 411 (2017). 5) EFSA. Choline-stabilised orthosilicic acid added for nutritional purposes to food supplements. EFSA J. 7, 948 (2009).

The bioavailability of silica in foods and beverages depends on the total silica content and the form in which it is present ^{6,7}. This varies greatly depending on the chemical structure. OSA, a monomeric form, is one of the most bioavailable sources of silica due to its high solubility ^{12,13}. In contrast, the oligomeric and polymeric forms are poorly absorbable in the gastrointestinal tract.

Method



G5 SILIPLANT/G7 SILIPLANT

60 mL liquid form,

Composition: 21.6 mg OSA with a blend of plant extracts (500 mg/L Equisetum arvense and 250 mg/L Rosmarinus officinalis) and no preservatives (batch number 15033)



ORGONO POWDER

Powdered form

Composition: of 1.4 g, containing 21.6 mg of OSA (providing a high amount of silicic acid in monomeric form at a concentration of 1.5% elemental silica and 5% monomeric OSA) microencapsulated with maltodextrin and without preservatives (batch number OSP 1407).



G7 ALOE

120 mL liquid form,

Composition: 21.6 mg of OSA with aloe vera (fresh aloe vera juice q.s. (quantum satis) 1 L Aloe barbadensis Miller), 100% organic pulp, 500 mg/L potassium sorbate and 350 mg/L citric acid) (batch number 14097)

The blinded oral silica dietary supplements were sequentially numbered 111, 222 and 333, corresponding to **G5 Siliplant**, **Organo Powder** and **G7 Aloe**, respectively. All nutritional supplements were ultimately presented in the same volume (120 mL) to preserve blindness in appearance or any other physical characteristics and were similar in odour and taste. They were administered orally in an opaque glass to avoid visual interference. An independent investigator unrelated to the study was the person who performed the final presentation of the Silica dietary supplements, ensuring participant and investigator blindness.

The Clinical Research Ethics Committee approved the study of the Hospital Universitari Sant Joan (15-02-26/2assN1). All procedures and protocols were applied according to the Declaration of Helsinki and the International Conference Harmonization and Good Clinical Practice (ICH GCP) and reported according to CONSORT criteria.

You can download the original document by clicking [HERE](#) for full details of the research.

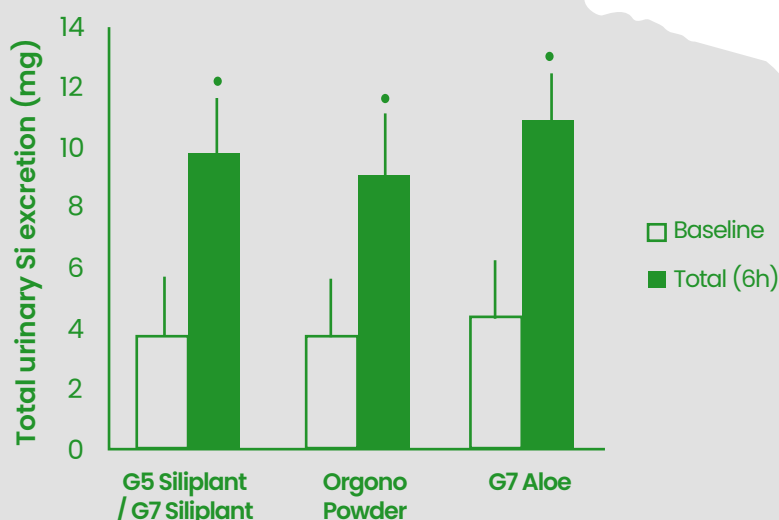
6) Jugdaohsingh, R. Silicon and bone health. J. Nutr. Health Aging 11, 99–110 (2007). 7) Powell, J. J. et al. A provisional database for the silicon content of foods in the United Kingdom. Br. J. Nutr. 94, 804–812 (2005). 12) Van Dyck, K., Van Cauwenbergh, R., Robberecht, H. & Deelstra, H. Bioavailability of silicon from food and food supplements. Fresenius J. Anal. Chem. 363, 541–544 (1999). 13) Jugdaohsingh, R. et al. Oligomeric but not monomeric silica prevents aluminum absorption in humans. Am. J. Clin. Nutr. 71, 944–949 (2000). 15) Refitt, D. M., Jugdaohsingh, R., Thompson, R. P. H. & Powell, J. J. Silicic acid: its gastrointestinal uptake and urinary excretion in man and effects on aluminium excretion. J. Inorg. Biochem. 76, 141–147 (1999). 16) Marcowycz, A. et al. Digestive absorption of silicon, supplemented as orthosilicic acid–vanillin complex. Mol. Nutr. Food Res. 59, 1584–1589 (2015).

Results

The percentage of silica absorption is derived from the consumption of conventional foods. In these cases, smaller amounts of silica are ingested so that in a standard diet, the absorption of silica would not be achieved, as is the case with the products under study. Analyzing silica levels in urine allows us to affirm that the products evaluated are assimilated with an equivalent bioavailability between them.

The reason for being able to state this is because, according to Pruksa, S. et al. 2014¹⁷, silica excreted in urine is a reliable and accurate measure of silica uptake after silica overload.

The reliability of the data obtained in urine is reinforced by data presented by Reffitt in 1999¹⁵, which demonstrate that the concentration of silica in blood (area under the curve) correlates significantly with the levels of silica excreted in urine.



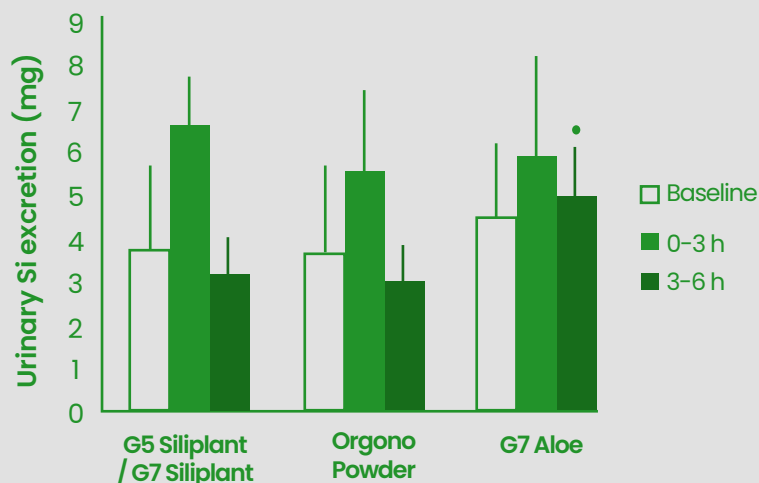
(Fig. 1). In terms of concentration, basal urinary Si levels were 10.5 ± 3.0 mg/L before G5 Siliplant ingestion, 11.0 ± 3.0 mg/L before Orgono powder ingestion, and 9.3 ± 2.3 mg/L before G7 Aloe ingestion, with no significant differences between them.

Ingestion of G5 Siliplant, Orgono Powder and G7 Aloe markedly increased total urinary Si excretion after 6 hours (Fig. 1). Thus, G5 Siliplant induced an increase in Si excretion of 163% above baseline ($p = 0.002$), Orgono Powder induced an increase of 149% ($p = 0.026$), and G7 Aloe induced an increase of 142% ($p = 0.001$). Furthermore, a comparison of Si excretion among the three dietary supplements, controlling for baseline values, showed no difference in total Si excretion 6 hours after consumption ($p = 0.238$).

This analysis revealed that the levels of Si excreted during the first 3 hours were not significantly different after ingesting the three other dietary supplements ($p = 0.514$). The amount of Si excreted in the urine during the entire 3–6 hour collection period after ingestion of G7 Aloe was significantly higher than after ingestion of G5 Siliplant and Orgono Powder ($p < 0.01$).

Furthermore, while urinary Si excretion during the 3- to the 6-hour interval was below baseline after supplementation with G5 Siliplant and Orgono Powder, after ingestion of G7 Aloe, urinary Si levels remained above baseline during this period (Fig. 2).

17) Pruksa, S., Siripinyanond, A., Powell, J. J. & Jugdaohsingh, R. Silicon balance in human volunteers; a pilot study to establish the variance in silicon excretion versus intake. *Nutr. Metab. (Lond)*. 11, 4 (2014).

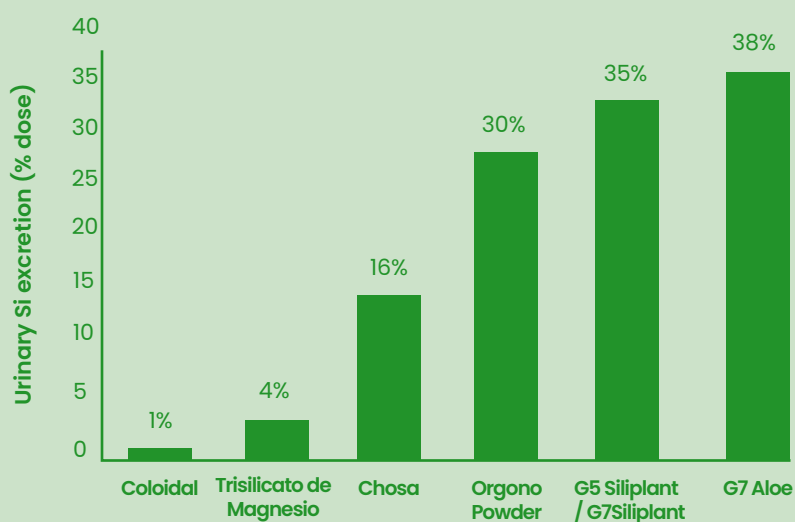


(Fig. 2). Si excretion at baseline and the two collection periods (0-3 h and 3-6 h) after administration of G5 Siliplant (liquid form), Orgono Powder (powder form) and G7 Aloe (liquid form; all contain 21.6 mg Si) in healthy subjects. Results are expressed as total milligrams excreted in the urine. Values are mean \pm SD (n = 5) *, p < 0.05 for G5 Siliplant and Orgono Powder over the same time.

Conclusions

The results obtained in the CTNS study were compared with the data published in the 2009 study by Sripanyakorn et al.

The comparison showed that **Organic Silica in the form of monomethyl silanetriol showed the highest percentage of absorption at 64%** (i.e., the rate of the consumed dose excreted in the urine), followed by a low-concentration OSA solution and choline-stabilized OSA, which showed 43% and 16% absorption, respectively.



On the contrary, the lowest Si absorption percentages were observed in magnesium trisilicate (4%) and colloidal Si (1%) 14. This study confirms that silica absorption is inversely correlated with the degree of polymerization of this mineral. Thus, silica absorption depends not only on whether it is organic or inorganic silica but also on whether it is in monomeric or polymeric form and, in the latter

case, on its degree of polymerization.

In the present study, the percentage of absorption was 35% for G7 Aloe, 32% for G5 Siliplant and 27% for Orgono Powder. Therefore, we can state that the relative absorption of OSA with maltodextrin (Orgono Powder) appears to be considerably higher than the relative absorption of choline-stabilized OSA, with an absorption percentage of 16%, and is higher than magnesium trisilicate (4%) or colloidal Si (1%).



The study of Si bioavailability is of great interest because of its impact on human health. Human, animal and in vitro studies indicate that Si **in nutritional and supranutritional amounts supports bone and connective tissue health**, may have a modulatory effect on the immune or inflammatory response and has been associated with mental health. In addition, epidemiological studies showed that dietary Si was favourably related to bone density and bone turnover markers. In addition, **silica in nutritional amounts may reduce the risk of Alzheimer's disease and may improve skin conditions or damaged hair and nails.**



SILICIUM
LABORATORIES 

SILICIUM ESPAÑA LABORATORIOS SL | Parc Tecnològic i de serveis l'Alba
C/Vilafortuny 23, Nave 10 | 43480 Vila-seca - Spain
Tel.: (+34) 877 44 99 48 | E-mail: info@siliciumg5.com

www.siliciumG5.com