WHOLE ROCK AND STRONTIUM ISOTOPE GEOCHEMISTRY OF THE ROCKS FROM THE VINEYARDS IN SÃO JOAQUIM, BRAZIL

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INTRODUCTION

São Joaquim is the main producer of European grapes (*Vitis vinifera L.*) in the state of Santa Catarina (Brazil) with 138 hectare of vineyards (EPAGRI, 2019) and an estimated annual production of 1,100,000 liters of wine (SANTOS et al., 2019) that are made with varieties such as Cabernet Sauvignon, Merlot, Sauvignon Blanc, Sangiovese, Pinot Noir, Chardonnay, Montepulciano, Cabernet Franc, Vermentino and Touriga Nacional. The geology of the municipality (Figure 1) is composed of volcanic rocks from two formations of the Serra Geral Group (~134 Ma; Inferior Cretaceous): the Vale do Sol Formation with thick and extensive tabular rubbly pahoehoe lava flows of basaltic andesites and subordinate andesites and basalts; and the Palmas Formation with thick tabular lava flows, lava domes, lava lobes and shallow conduit systems of dacites and subordinate rhyolites (Figure 2) (SANTOS, in process; CPRM, 2022).

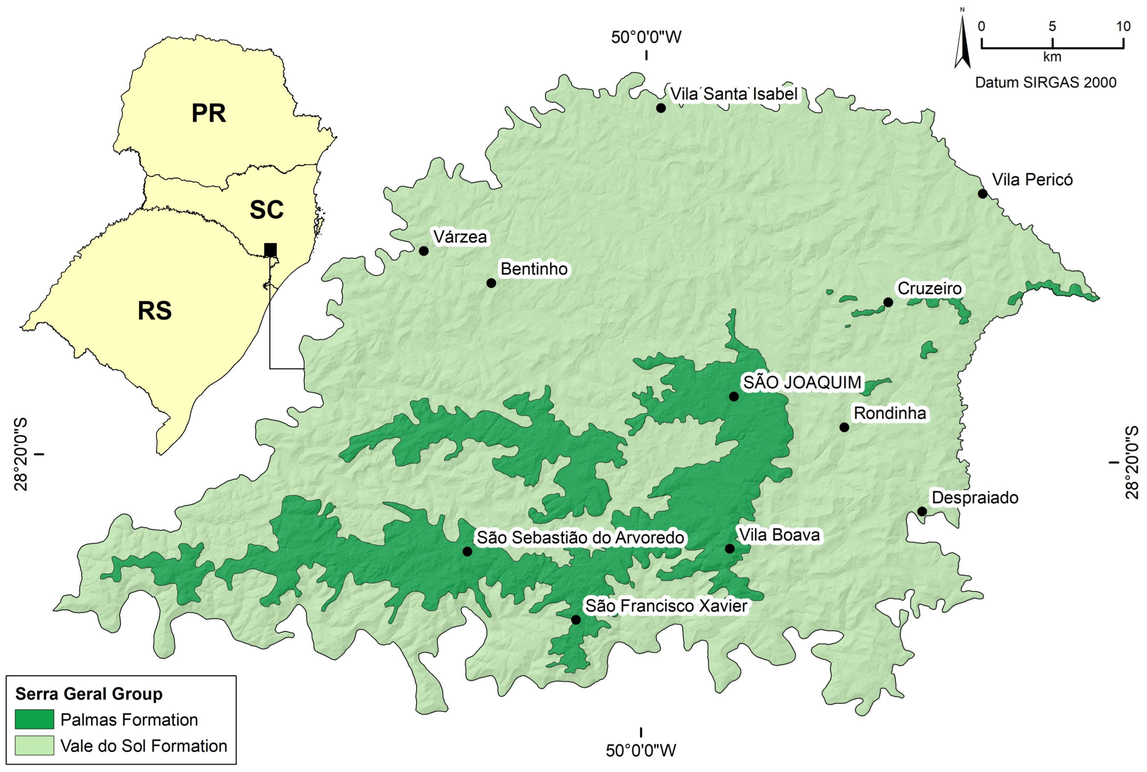

Figure 1 – Geological map of São Joaquim, Brazil. Source: modified from CPRM (2022).

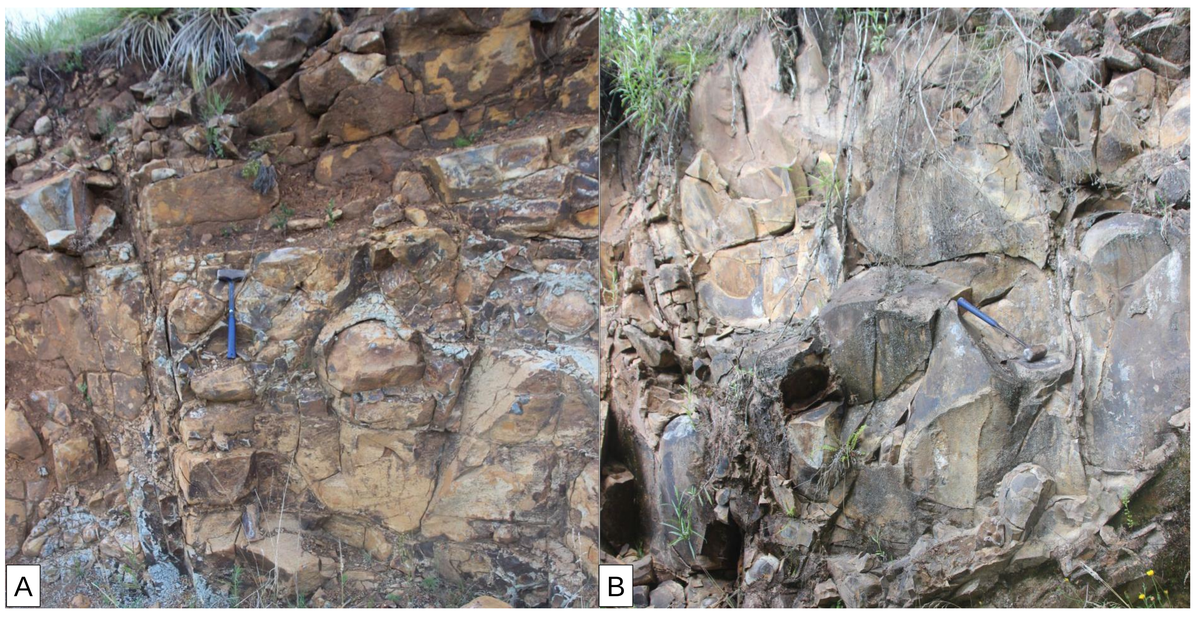

Figure 2 – Rock site of: (A) Vale do Sol and (B) Palmas formations in São Joaquim, Brazil.

OBJECTIVE

The main goal is the study the whole rock and strontium isotope geochemistry of the rocks from the vineyards in the municipality of São Joaquim, state of Santa Catarina (Brazil) in order to characterize the geochemical contribution to the viticultural *terroir*.

MATERIALS & METHODS

The whole rock geochemical analyses (12 samples from Vale do Sol Formation and 4 samples from Palmas Formation) were obtained from SGS GEOSOL laboratories with ICP-OES (Inductively Coupled Plasma Optical Emission Spectrometry) and ICP-MS (Inductively Coupled Plasma Mass Spectometry). The strontium isotope ($^{87}Sr/^{86}Sr$) geochemistry (4 samples from Vale do Sol Formation and 4 samples from Palmas Formation) was analyzed at GEOTOP laboratories using a Thermo TRITON PlusTM Thermal Ionization Mass Spectrometer (TIMS).

RESULTS

From the 16 rock samples analyzed for whole rock geochemistry (Figure 3): five were classified as low-Ti (1.38 – 1.59 w.t.% TiO_2) basaltic andesites (52.42 – 54.16 w.t.% SiO_2) of Gramado magma-type, four as low-Ti (0.86 – 0.91 w.t.% TiO_2) dacites (68.07 – 69.17 w.t.% SiO_2) of Palmas magma-type, two as low-Ti (1.27 – 1.49 w.t.% TiO_2) basalts (50.31 – 51.72 w.t.% SiO_2) of Gramado magma-type, one as high-Ti (3.61 w.t.% TiO_2) basalt (50.73 w.t.% SiO_2) of Urubici magma-type (dyke), one as high-Ti (4.10 w.t.% TiO_2) trachybasalt (50.25 w.t.% SiO_2) of Urubici magma-type, one as high-Ti (4.04 w.t.% TiO_2) basaltic trachyandesite (52.14 w.t.% SiO_2) of Urubici magma-type and one as low-Ti (1.58 w.t.% TiO_2) andesite (57.61 w.t.% SiO_2) of Gramado magma-type.

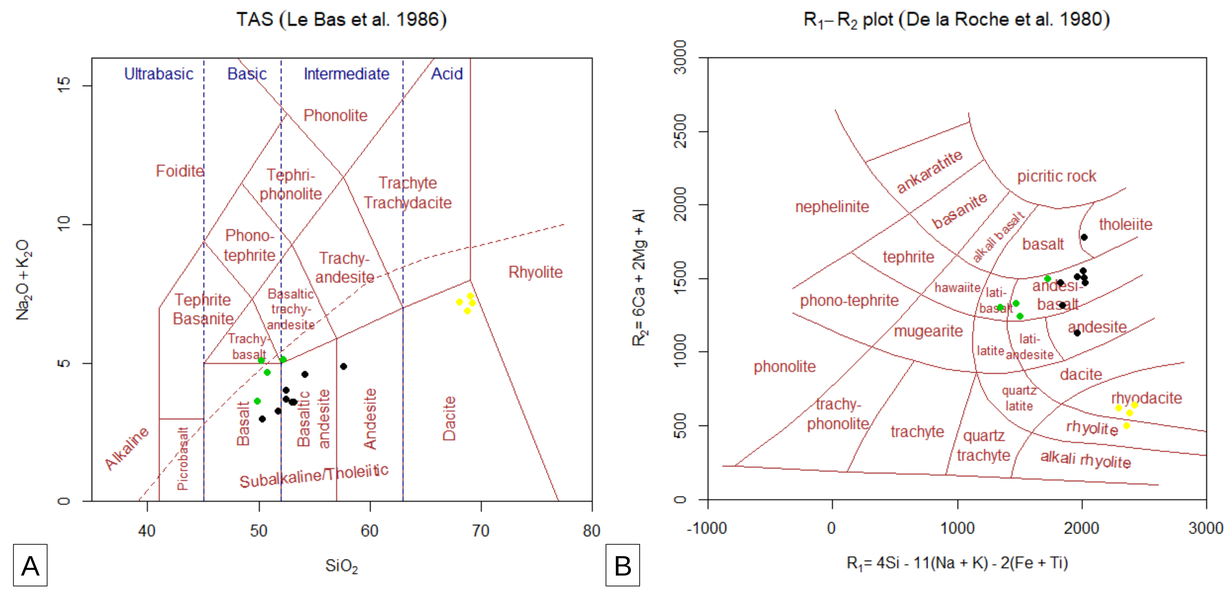

Figure 3 – Rock classification diagrams: (A) TAS and (B) R1-R2 plot. (green dot – Urubici, black dot – Gramado and yellow dot – Palmas magma-type).

From the 8 rock samples analyzed for isotopic geochemistry ($^{87}Sr/^{86}Sr$) (Table 1): in Vale do Sol Formation 2 samples yielded values from 0.705042 to 0.705236 (basaltic rocks of Urubici magma-type) and 2 samples yielded values from 0.707980 to 0.708997 (basaltic rocks of Gramado magma-type), and in Palmas Formation 4 samples yielded values from 0.718057 to 0.720145 (dacitic rocks of Palmas magma-type).

WINERY	FORMATION	MAGMA-TYPE	LITHOLOGY	$^{87}Sr/^{86}Sr$ (initial)	Peate, 1997
São Sebastião	Palmas	Palmas	Dacite	0.720145	0.7140 - 0.7280
Hiragami	Palmas	Palmas	Dacite	0.718847	0.7140 - 0.7280
Boutique D'alture	Palmas	Palmas	Dacite	0.718548	0.7140 - 0.7280
Estação Experimental	Palmas	Palmas	Dacite	0.718057	0.7140 - 0.7280
Villaggio Bassetti	Vale do Sol	Gramado	Basaltic Andesite	0.708997	0.7075 - 0.7167
Boutique D'alture	Vale do Sol	Gramado	Basalt	0.707980	0.7075 - 0.7167
Villa Francioni	Vale do Sol	Urubici	Trachy-Basalt	0.705236	0.7048 - 0.7065
Monte Agudo	Vale do Sol	Urubici	Basaltic Trachy-Andesite	0.705042	0.7048 - 0.7065

Table 1 - Strontium isotopes ($^{87}Sr/^{86}Sr$) of the rocks from the vineyards in São Joaquim, Brazil.

CONCLUSIONS

The geology and geochemistry signatures of the São Joaquim volcanic rocks are quite diverse. The whole rock geochemistry showed the presence of rocks that are commonly found in the southern portion of the Serra Geral Group and the isotopic geochemistry showed values that are coherent with compositions found in the literature for the observed magma-types.

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