

RHEOMETRICAL OPTIMIZATION OF VINE SHOOTS BIO-BASED CONCRETES

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CONTEXT

- Project Sarmentys II, funded by ADEME (AAP perfecto 2022) with Neveu, Builders and ENTPE.
- Focus on using vine shoots in bio-based concretes as an alternative aggregate
- No existing protocol for vine shoot-base concrete formulation

OBJECTIVE

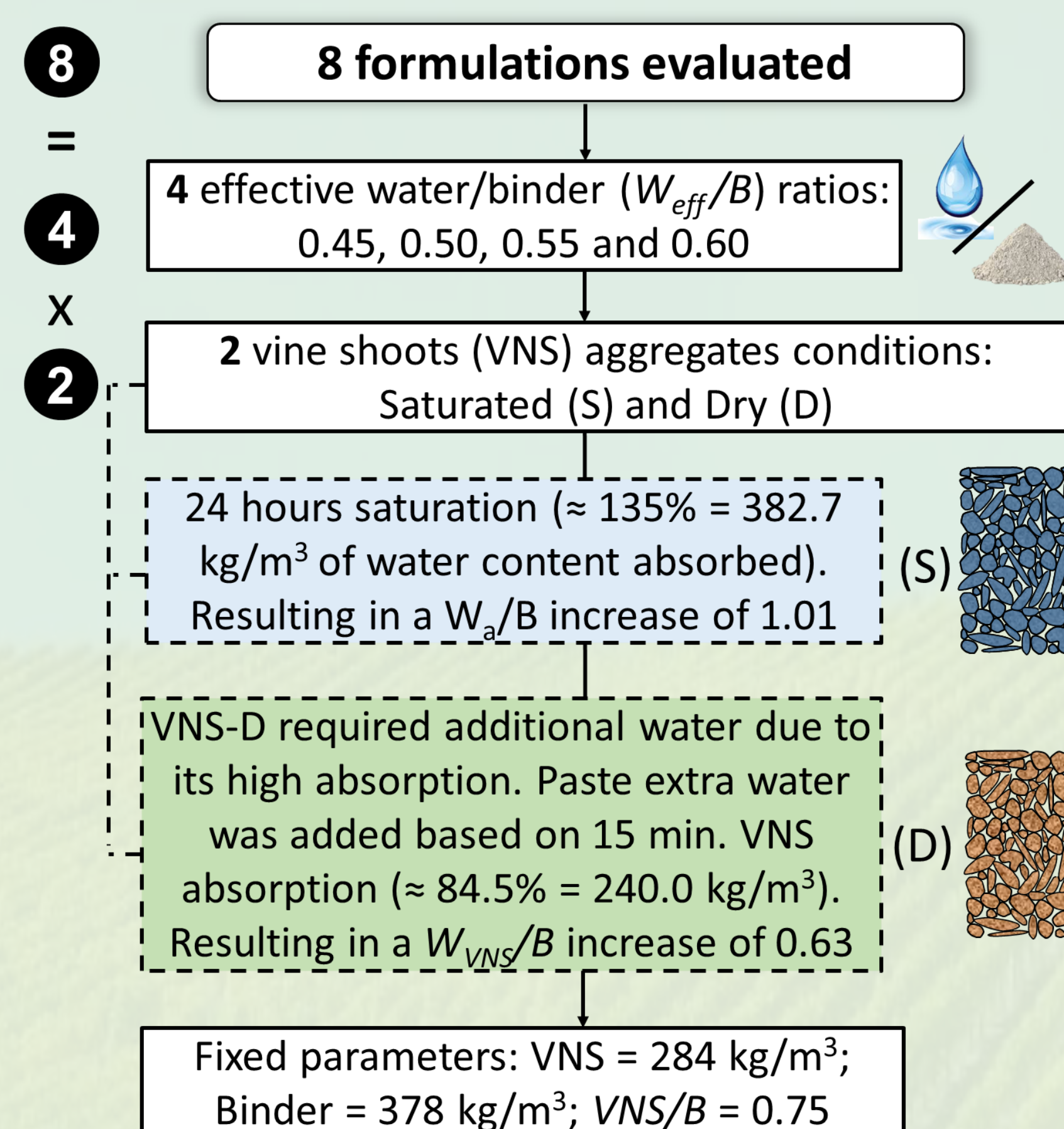
Optimize the vine shoots concrete water dosage using rheometry tools

APPROACH

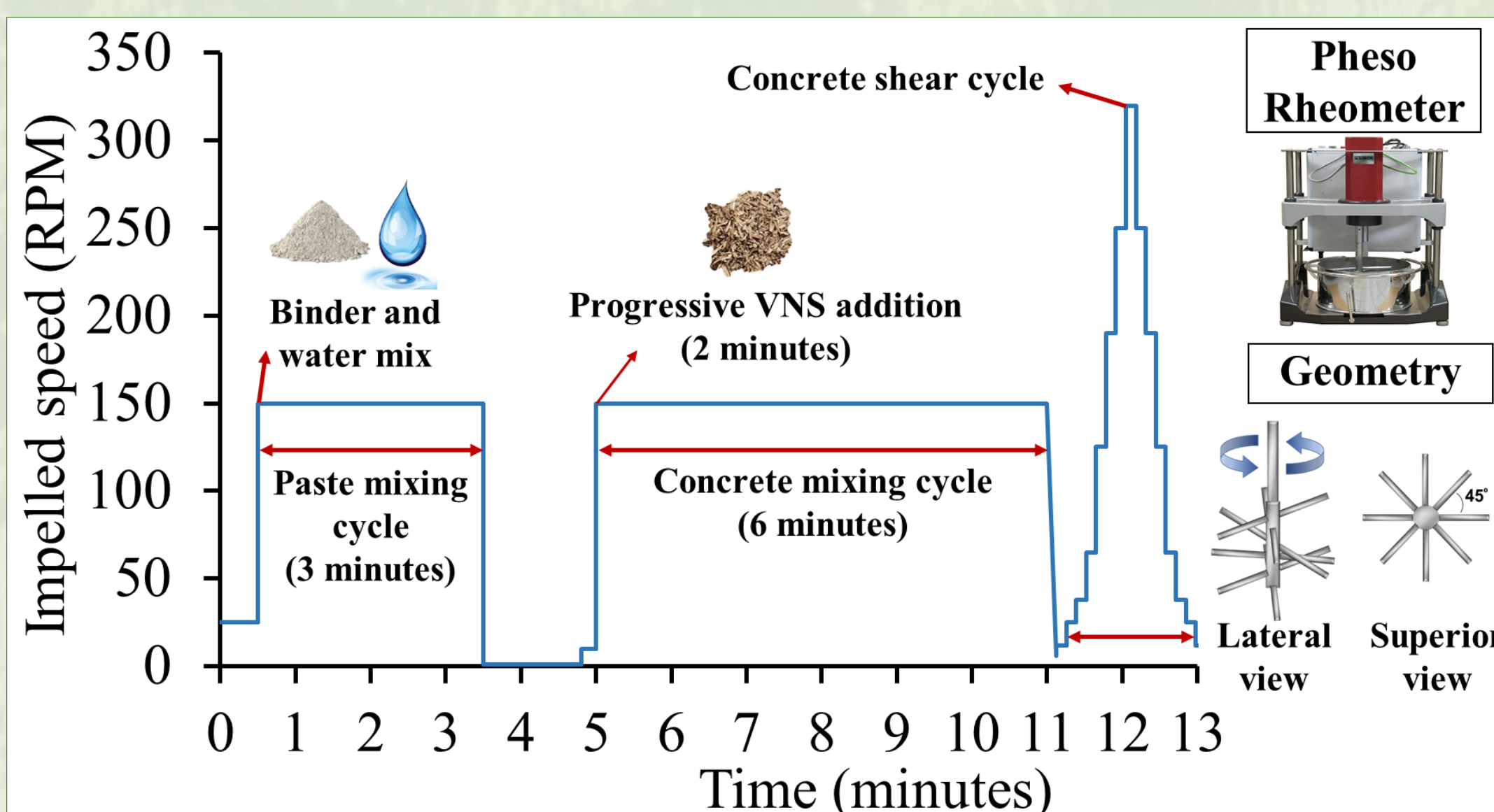
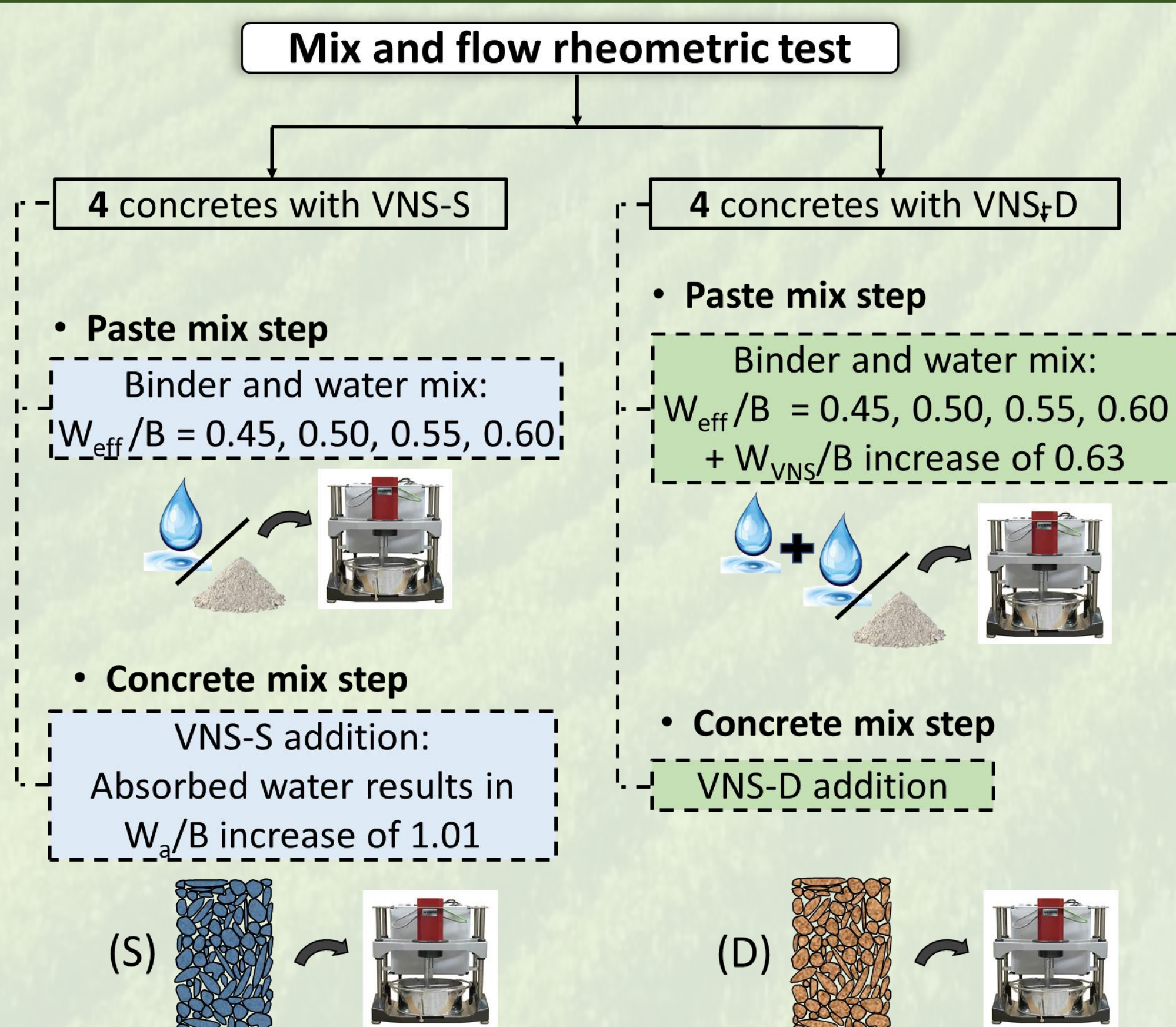
- Materials:** grinded vine shoots, lime based binder (Tradical thermo) and water



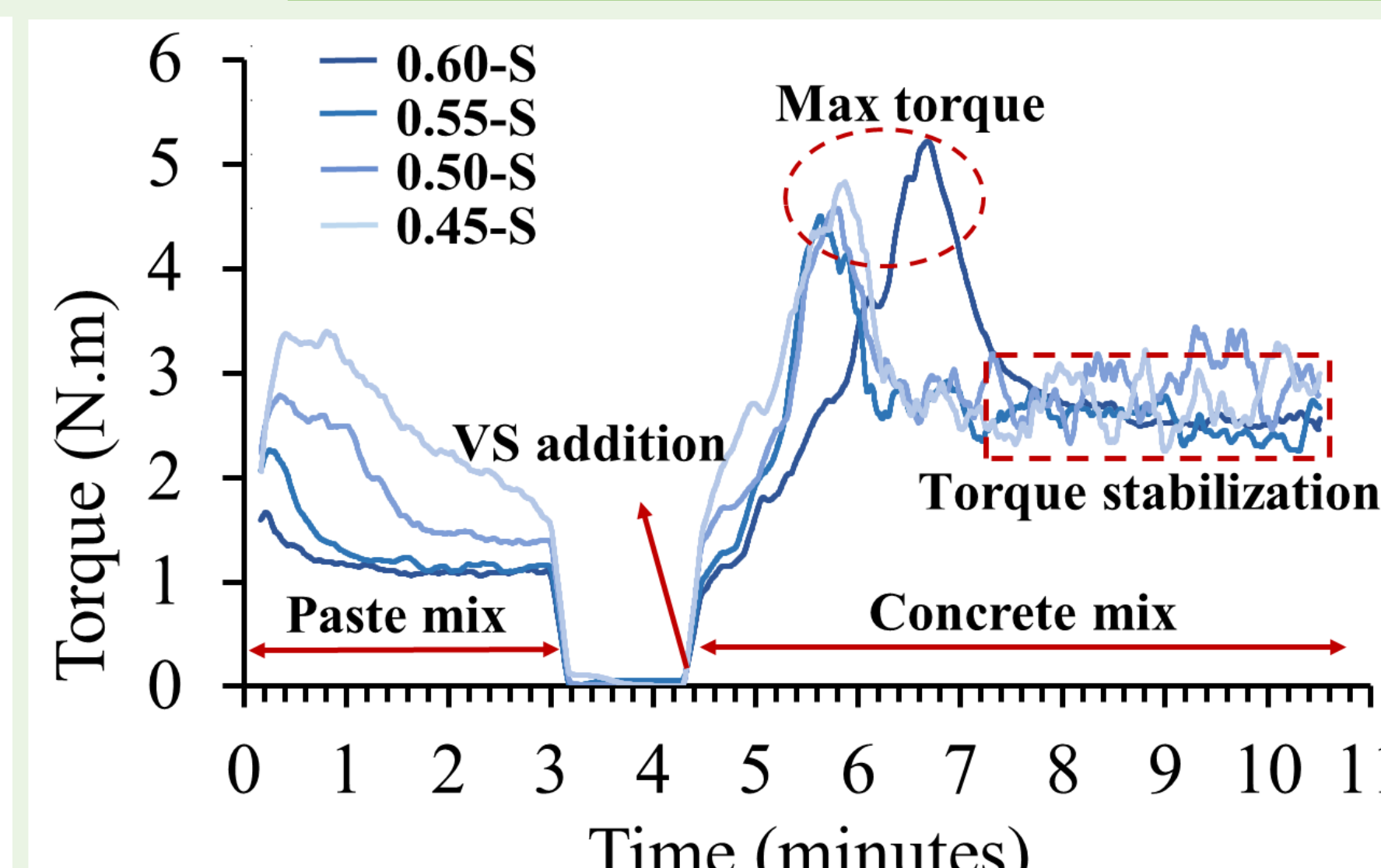
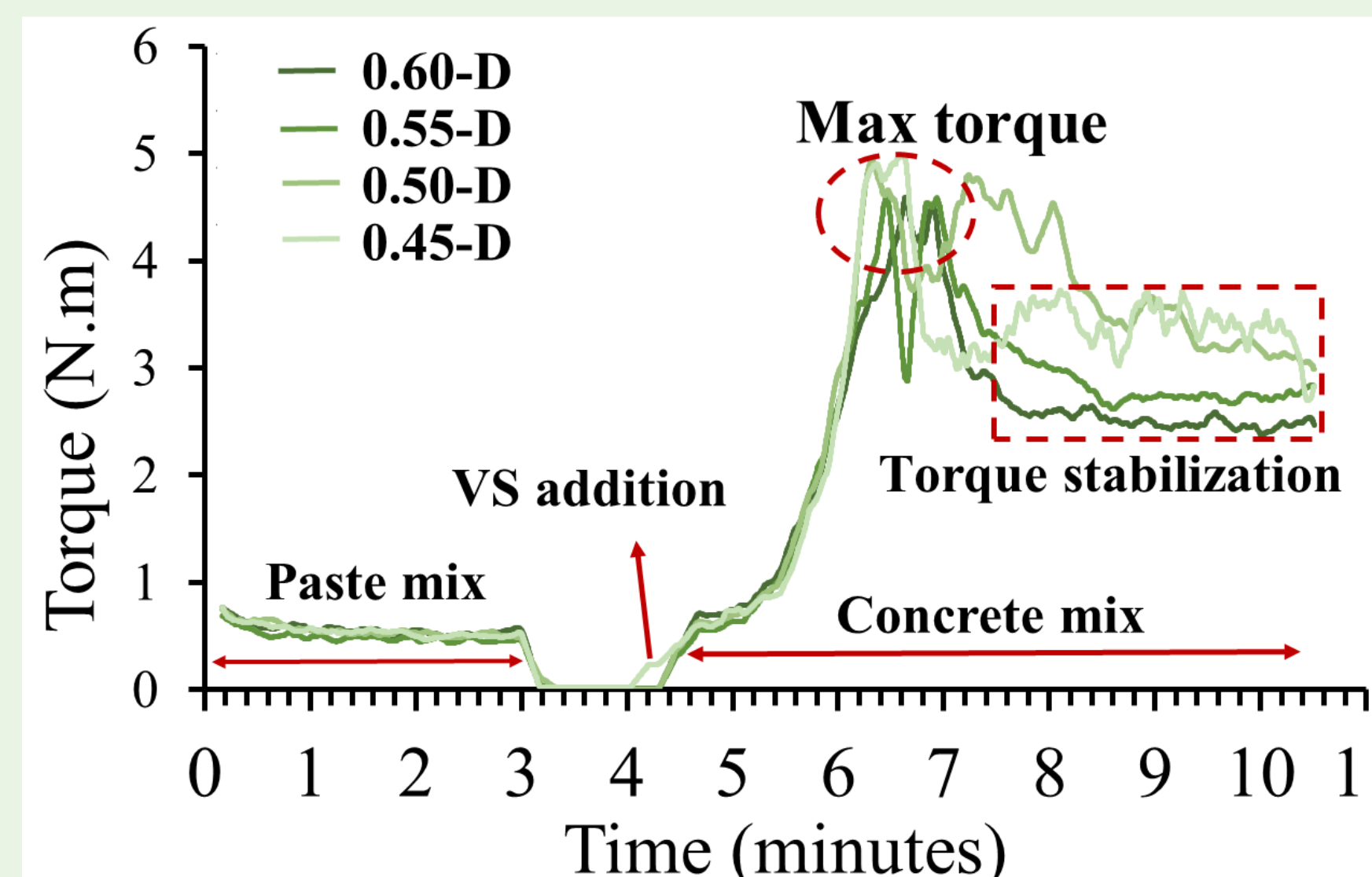
Vine shoots pruning Vine shoots grinding Concrete production Rheometrical evaluation of different water contents



RHEOMETRIC TEST PARAMETERS

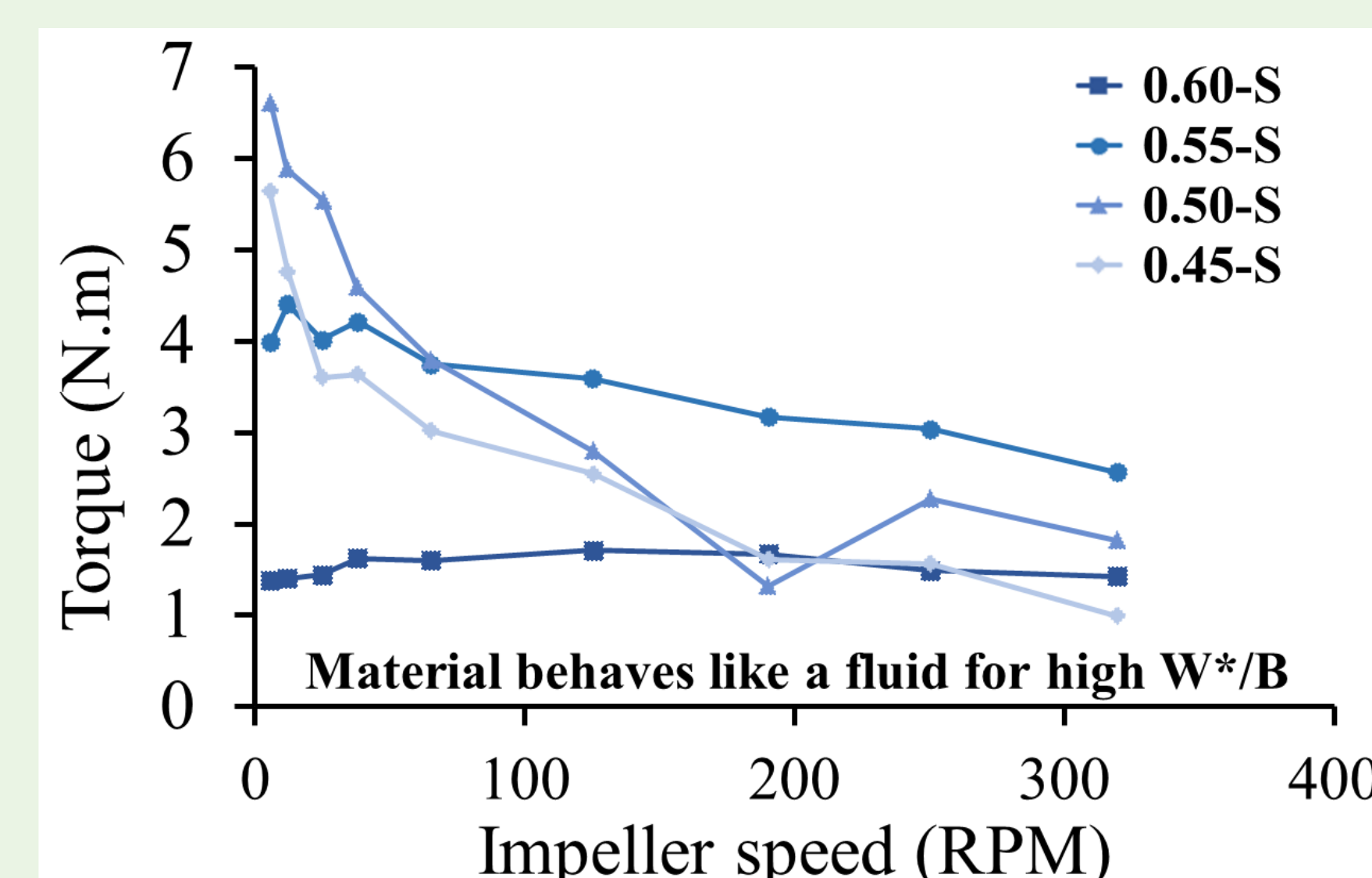
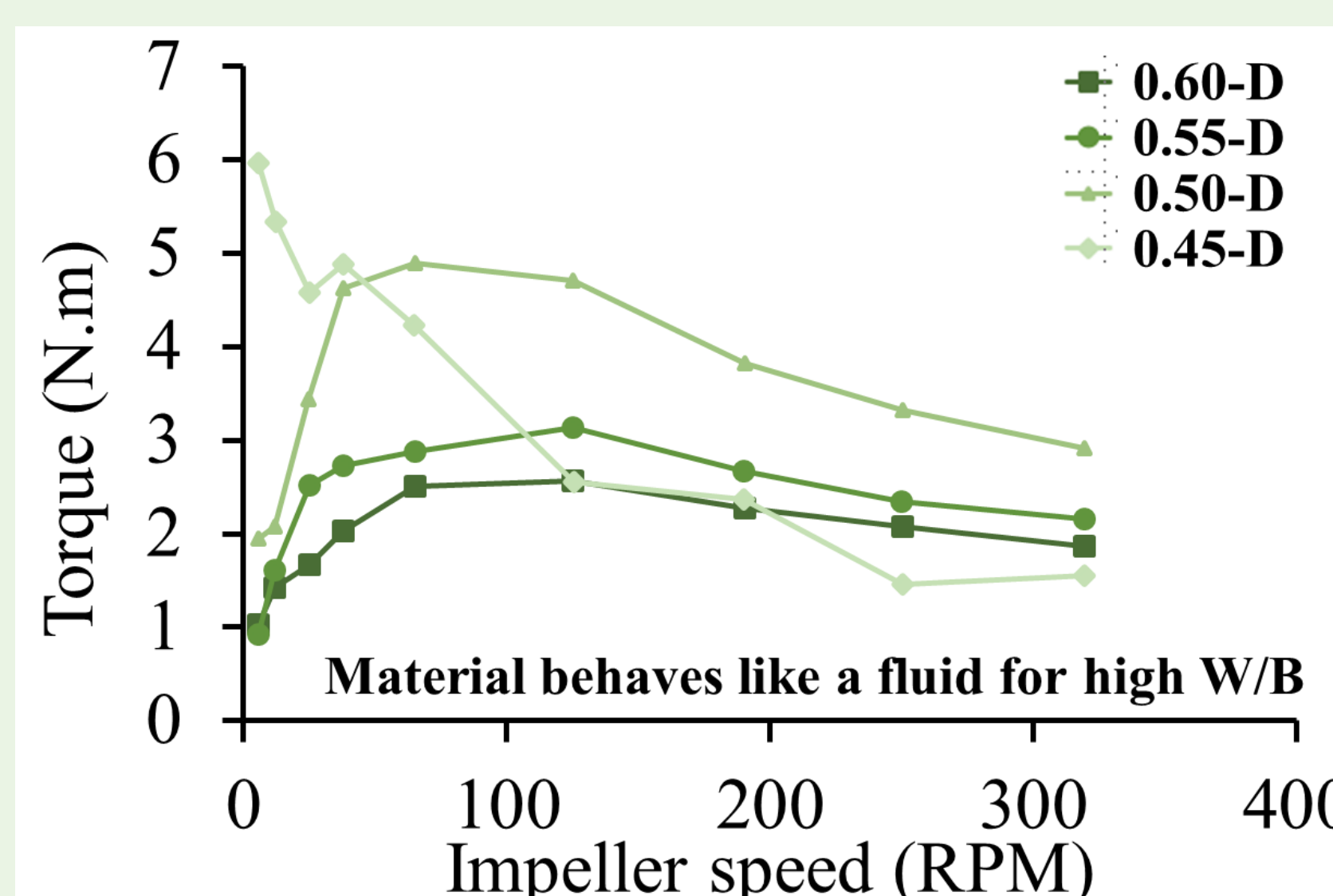


RHEOLOGICAL TESTS RESULTS



- Formulations with pastes without extra water and saturated aggregates showed higher mixing torques, with a difficult initial mixing;
- All formulations presented similar stabilization torque values, with smoother curves and lower stabilization torque values as the W_{eff}/B values increased;
- Formulations with saturated aggregates without additional water had higher overall mixing energy values.

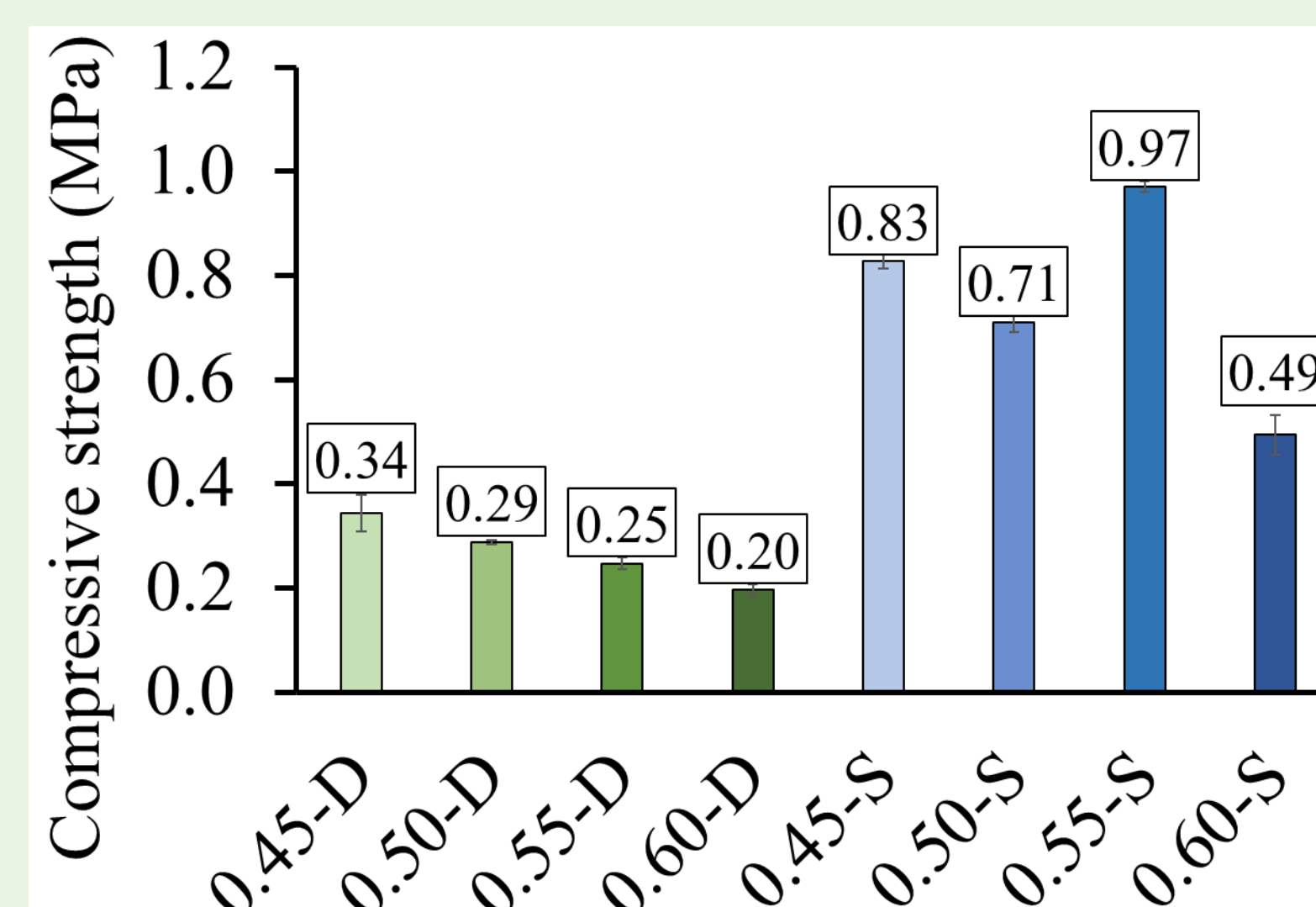
Flow test: Torque x Rotation speed



- Build-up of the mixes occurs on the rheometer walls when impeller speed increases, leading to a torque decrease generated by occurrence of dead zones.
- Formulations with a W_{eff}/B of 0.6 showed behavior closer to a fluid;
- Common rheological models can not be used to define the observed behaviors

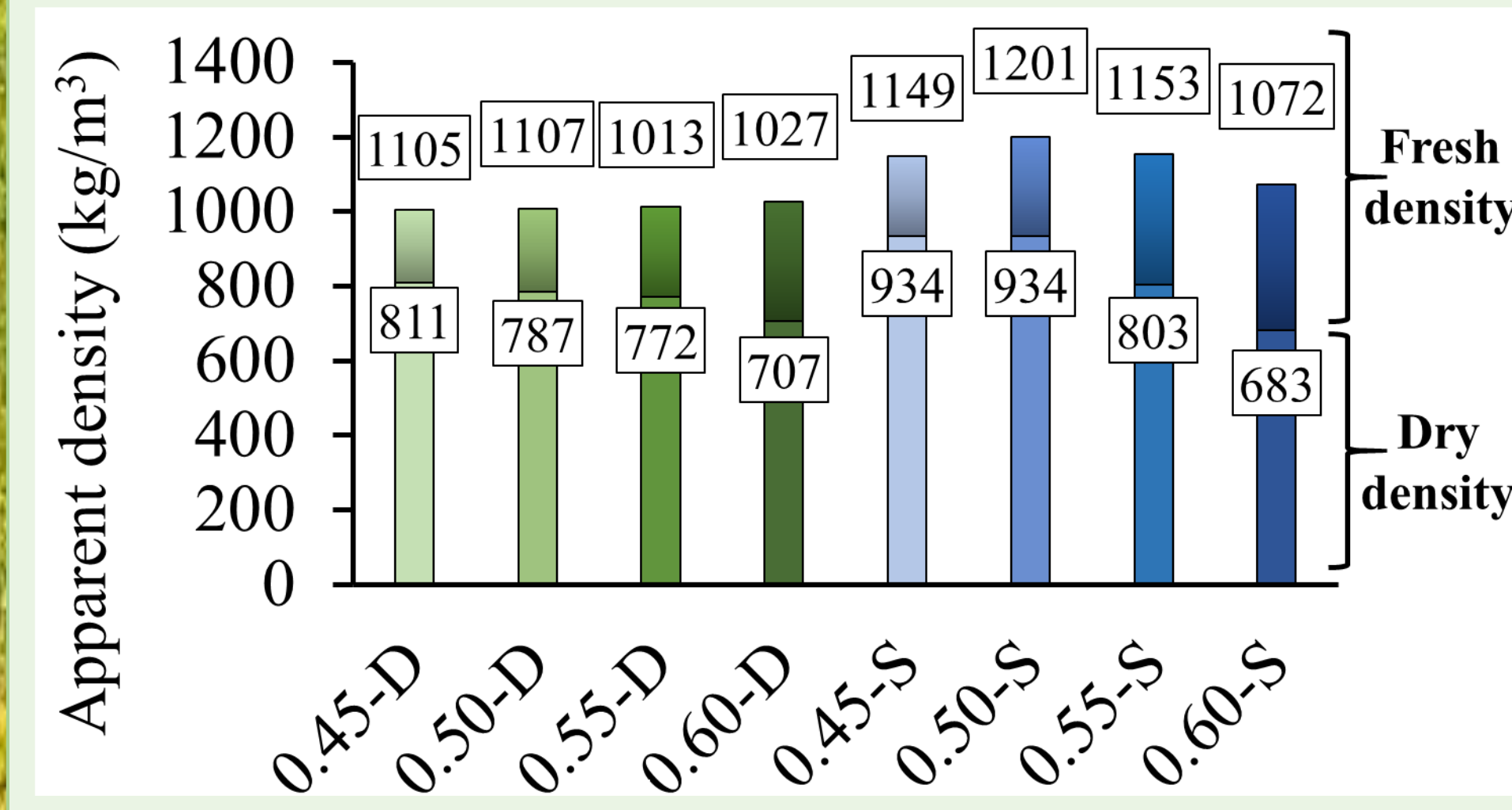
COMPLEMENTARY RESULTS

Compressive strength



- Increasing the W_{eff}/B ratio decreased the compressive strength values;
- The aggregates saturation increased the compressive strength values;
- Higher W_{eff}/B resulted in foam formation and increase in strength.

Apparent density



- Increasing the W_{eff}/B ratio increased the apparent density values;
- The aggregates saturation increased the apparent density values;
- Higher W_{eff}/B resulted in foam formation and decrease in dry density.

CONCLUSIONS

- The vine shoots aggregates' absorption affects the rheological performance of vine shoots concretes;
- The concretes with higher global water contents require less mixing energy and exhibit a more fluid-like behavior;
- The apparent densities are directly influenced by the global water content used;
- The saturation of the vine shoots aggregates leads to 2.5 times increase in the vine shoots concrete's compressive strength.

