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Low shears wet granulation processes: application to the structuration of the durum wheat semolina for the manufacture of couscous grains

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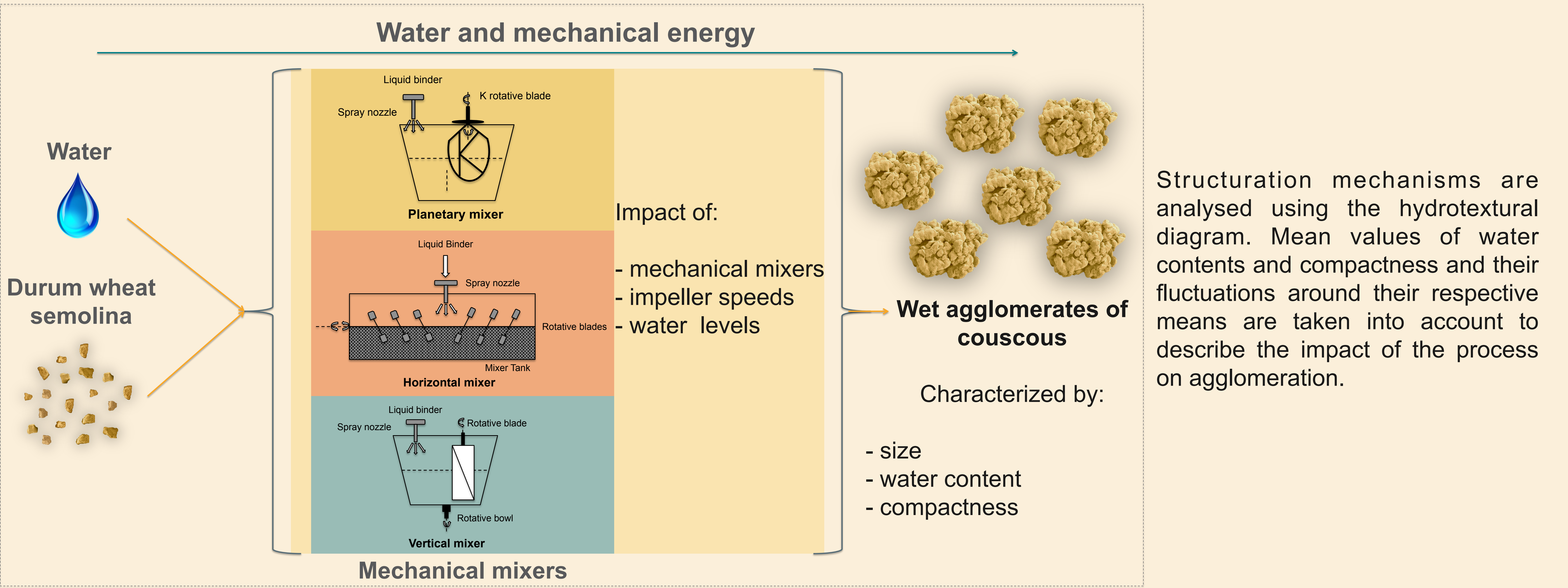


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1. INTRODUCTION

The variability of the raw materials associated with the differences between several apparatus induce a high degree of complexity in wet agglomeration. For the couscous production, the semolina is granulated using horizontal low shear mixer. The major aim of this work is to examine the **effect of process conditions** in low shear mixers and to **propose the basis of a unique continuous description**.

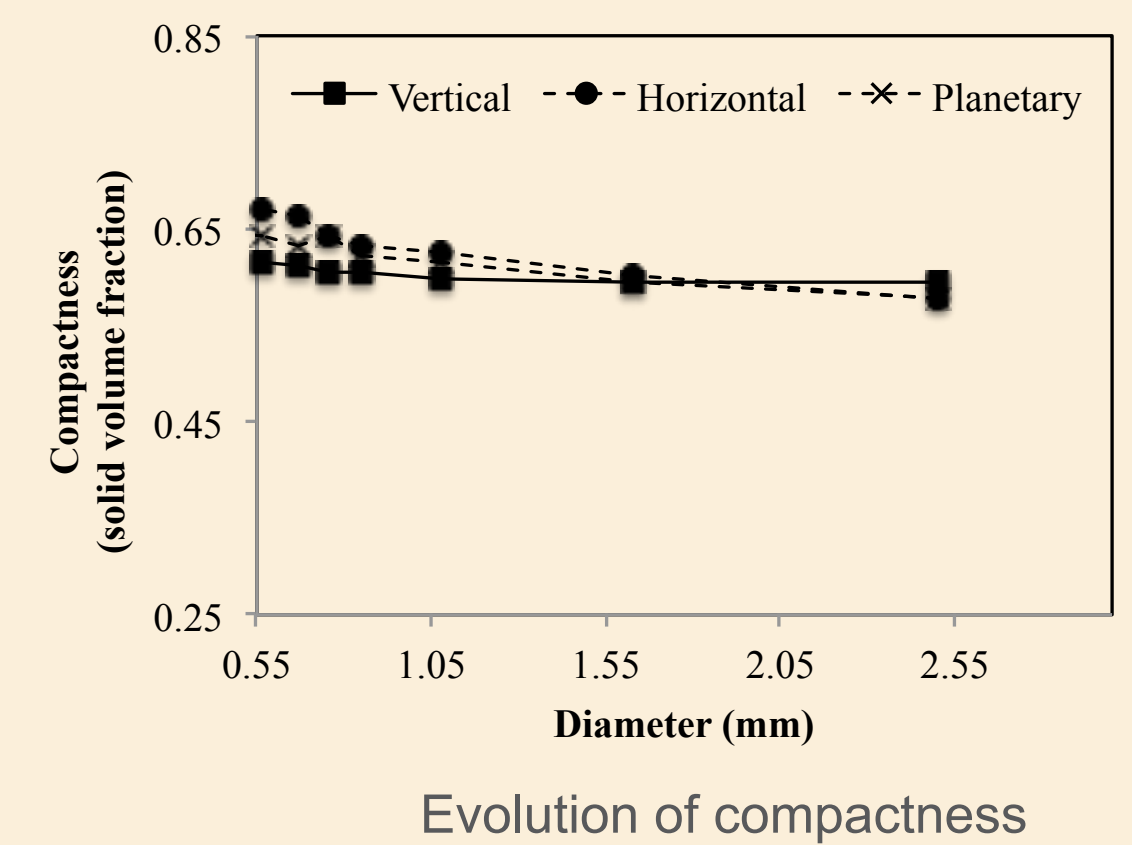
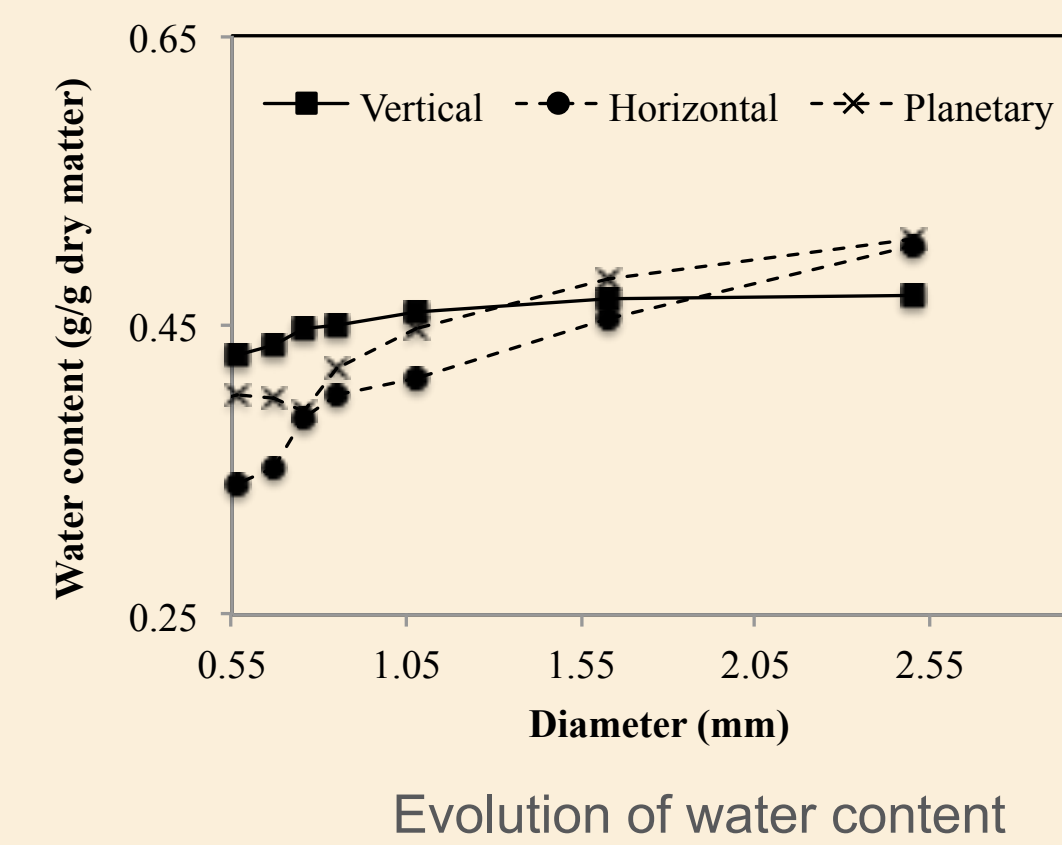
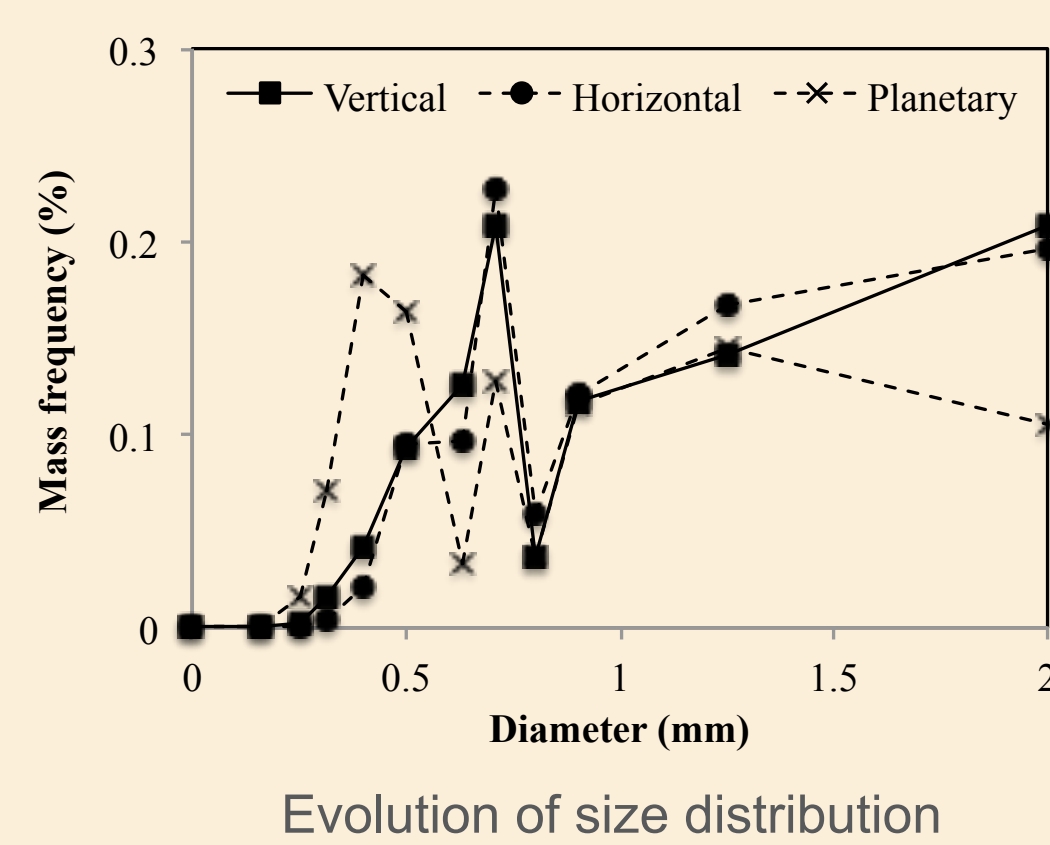
2. MATERIEL & METHODS



3. RESULTS FOR THE 3 MIXERS

→ Description of the wet agglomeration

4 populations are presents in all the mixers (fragments, nuclei, agglomerates and dough pieces). **Small structures and nuclei are less humid and more compact than larger structures.**



→ Impact of the speed

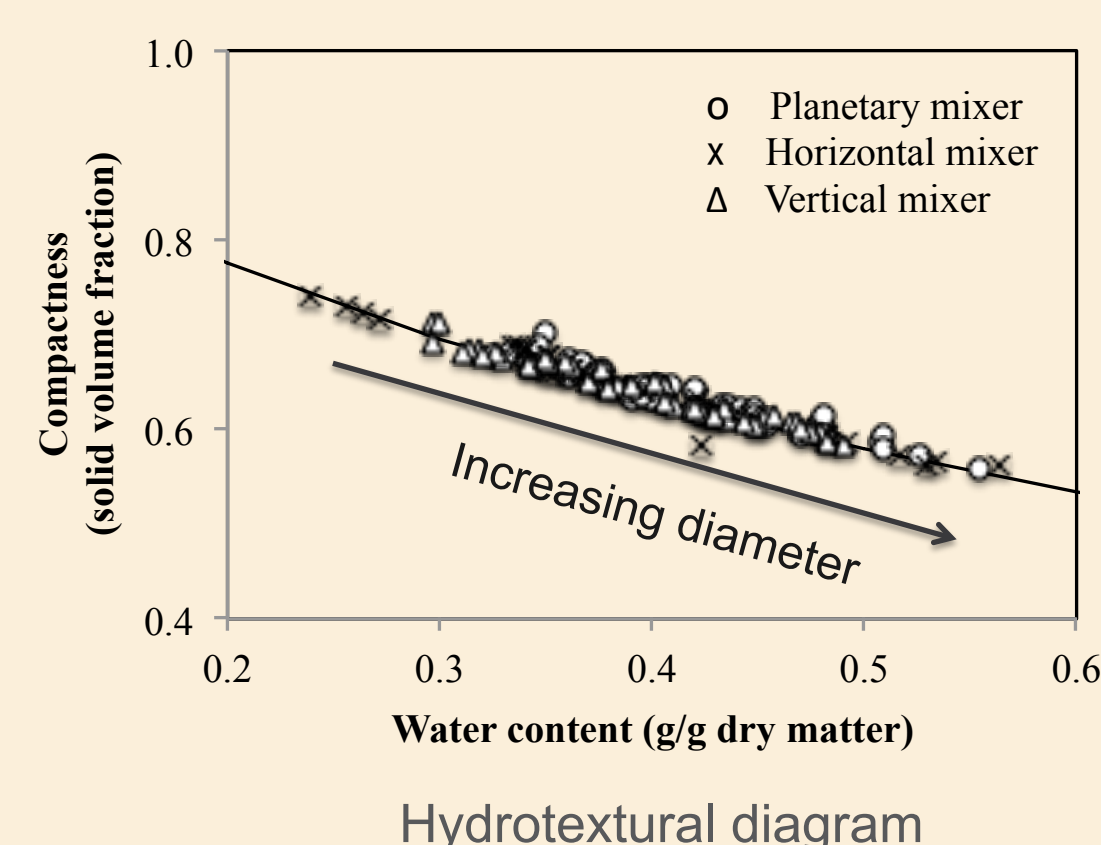
A higher impeller speed leads to an increase of the **breakage mechanisms**, which help to improve the homogeneity in the bed by promoting consolidation and growth mechanisms. There is **no impact of the speed on the water content and the compactness** of the structures.

→ Impact of the water addition level

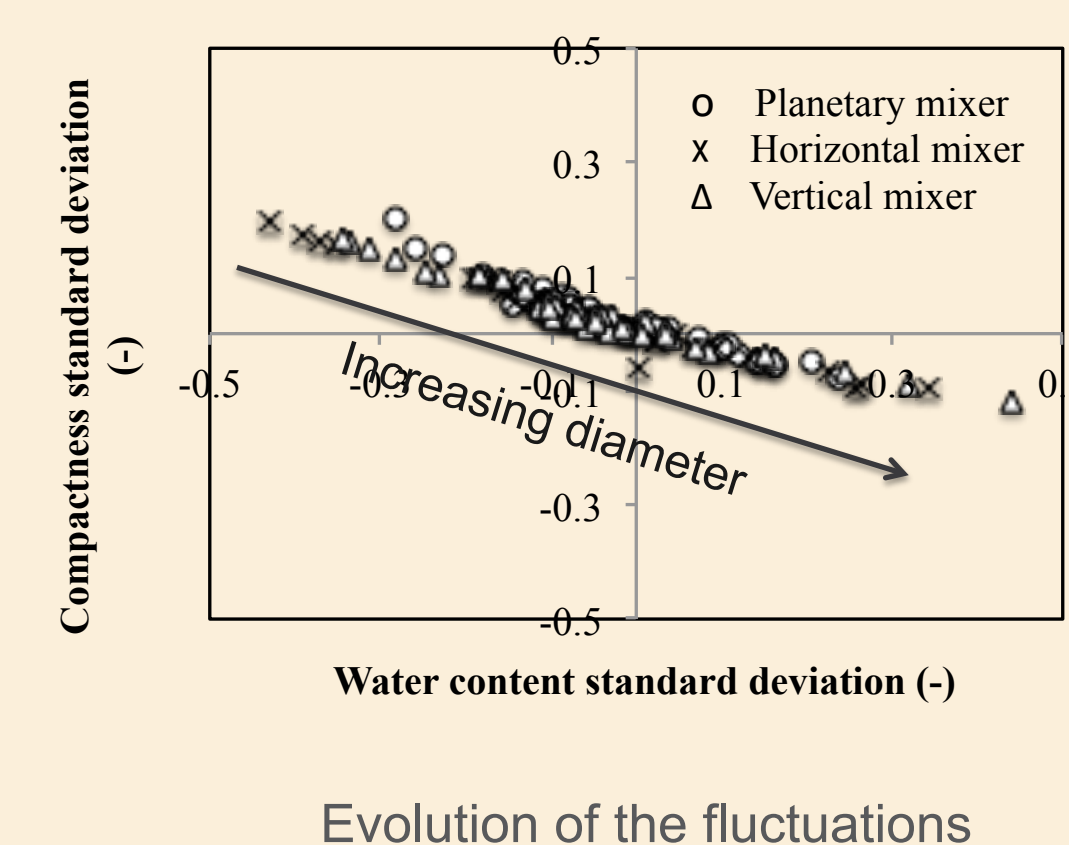
An increase of the water addition level leads to a decrease of the fragments and an increase of the nuclei, agglomerates and dough pieces. An increase of the water content and a decrease of the compactness are observed for all the structures.

4. DISCUSSION

Experiments show that all the structures are on the saturation curve, which indicates that they are all saturated in water whatever the mixers.



Fluctuations of the water content and the compactness are correlated around their respective mean values. The growth of the agglomerates respects an association by the same hydro-textural categories.



5. CONCLUSION

Agglomerates of durum wheat semolina are saturated whatever the processes and operating conditions. The evolution of the size distribution of the agglomerated structures with compactness shows a **continuous growth process associated with the expansion of their internal structure**. These **mechanisms** deal with (i) classical growth of associated particles to nuclei, then nuclei to agglomerates, and percolation to local paste state (dough pieces), and also (ii) fragmentation of dough pieces into a specific population of small saturated clusters, which are able to interact with nuclei. **It is possible to link different processes under low shear conditions to generate agglomerates with same specific functionalities.**