STUDYING THE FEEDING SYSTEM IMPACT ON TABLET PROPERTIES USING STYL'ONE™

SUSANA NIETO-BOBADILLA[1] | **BRUNO LECLERCQ**[1] | **THIERRY MENARD**[1]

CORRESPONDING AUTHOR: SUSANA NIETO-BOBADILLA | snieto@medelpharm.com

INTRODUCTION

Tablets are the most common pharmaceutical oral dosage forms. Maintaining acceptable tablet tensile strengths, a critical quality attribute, is capital during scale-up. Both, formulation and manufacturing process can affect tablet mechanical strength[1].

Lubricants are used on tablet formulations to reduce friction between the tablet and the surface of the die and punches avoiding adhesion to the tooling. It is well known that lubricants can affect tablet mechanical strength by interfering with the bonding forces of the powder particles[2].

However, the impact of the feeder system is sometimes not taken into account. Force feeders are used in tablet presses to ensure an efficient filling of the matrix die. The selection of the feeder rotation speed is empirical and adjusted to achieve the desired tablet weight and acceptable tablet-to-tablet weight variation. Even though limited, research about the effect of the force feeder speed on tablet tensile strength claims that this parameter should be studied during scale-up[1].

The aim of this work was to study the impact of the feeding system on tensile strength and ejection force of tablets containing different excipients and lubricant concentrations.

MATERIALS AND METHODS

Microcrystalline cellulose (MCC) and lactose tablets, lubricated with 0.1; 0.25 and 0.5% of magnesium stearate (MgSt) with blending time of 3 minutes, were fabricated using a Styl'One™, equipped with Euro B 11.28 mm round, flat punches.

A gravity and force feeder system at 24.5; 122.5 and 245 RPM (corresponding to 10, 50 and 100% of the paddle rotation speed) were used.

Tablet dimensions and hardness were measured with a Multi Tablet Hardness Tester. Ejection forces and tensile strengths were calculated by the Analis™ software of Styl'One™.

RESULTS AND DISCUSSION

For MCC (plastic material) tablets, even at low MgSt amounts (0.1%), the tensile strength decrease of 40% using a force feeder at high rotation speed, compared to a gravity feeder (Fig. 1A).

This effect was further increased at higher MgSt concentrations, where tablets presented capping when a force feeder at high (Fig. 1B), and also medium rotation speed (Fig. 1C) was used.

About lactose (brittle material) tablets, no significant loss on tensile strength was observed between the gravity and force feeder systems, at all MgSt concentrations tested (Fig. 2A-C). This effect can be linked to the over-blending of the powder with the MgSt particles inside the force feed shoe, leading to its over-lubrication (remarkable for materials with plastic deformation).

The ejection forces of MCC over-lubricated tablets remained low and constant (30 to 60N) (Fig. 3A). While those of lactose tablets at 0.1% MgSt, increased with the compression force and did not stabilize independent of the feeding system (gravity or force feeder) (Fig. 3B).

CONCLUSION

The impact of the force feeder on tablet tensile strength depends on the amount of lubricant, the compaction behavior of the material (deformation vs. fragmentation) and the rotation speed of the feeder.

This can be easily and quickly evaluated on a Styl'One™ using only small amounts of powder early in R&D stages, ensuring appropriate tablet properties during scale-up.

REFERENCES

1. Narang, A.; Rao, V., Guo, H.; Lu, J. and Desai, D. Effect of force feeder on tablet strength during compression, Int. J. Pharm. 401, 7-15 (2010).
2. Wang, J.; Wen, H. and Desai, D. Lubrication in tablet formulations, Eur. J. Pharm. Biopharm. 75, 1-15 (2010).

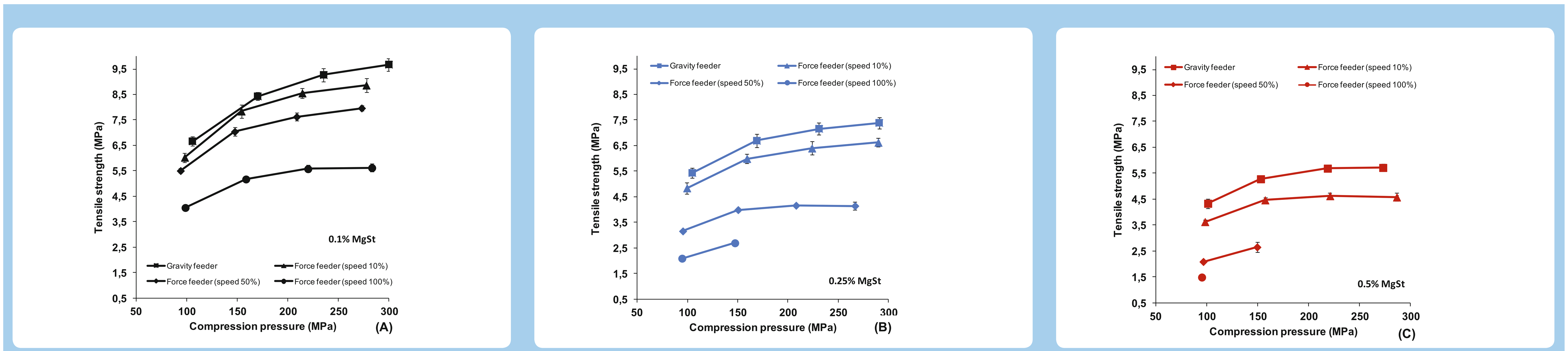

Fig. 1: Tensile strength of MCC tablets containing **(A)** 0.1% MgSt **(B)** 0.25% MgSt and **(C)** 0.5% MgSt fabricated using a gravity or force feeder (at 10, 50 and 100% of the maximum speed rotation).

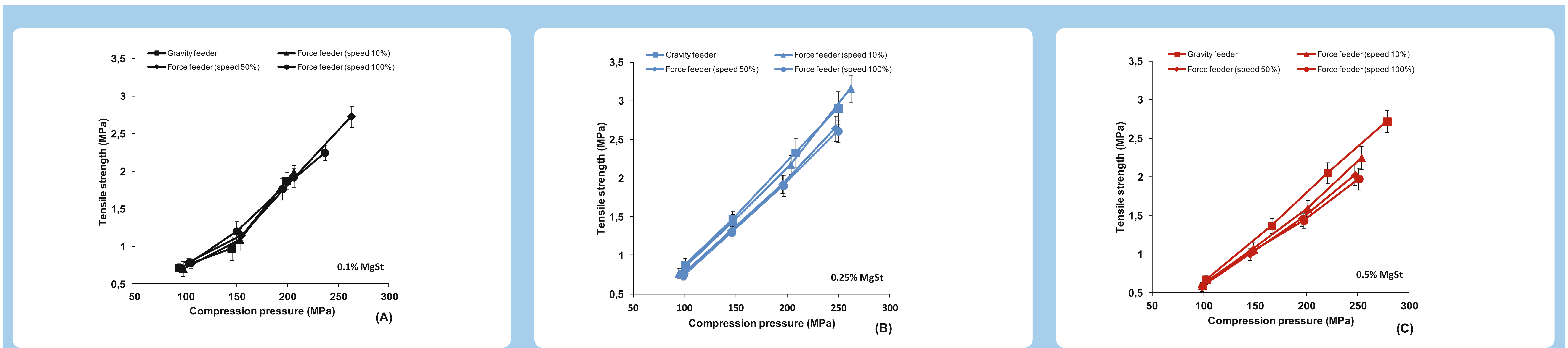

Fig. 2: Tensile strength of lactose tablets containing **(A)** 0.1% MgSt **(B)** 0.25% MgSt and **(C)** 0.5% MgSt fabricated using a gravity or force feeder (at 10, 50 and 100% of the maximum speed rotation).

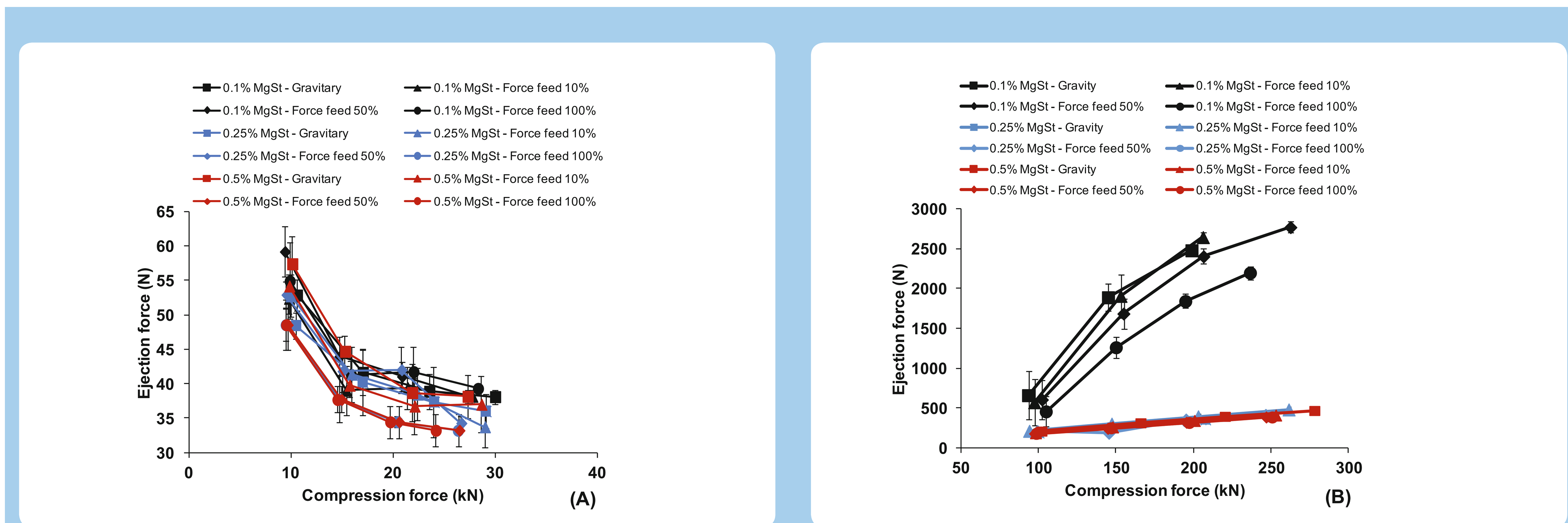

Fig. 3: Ejection forces of **(A)** MCC and **(B)** lactose tablets containing 0.1, 0.25 and 0.5% MgSt fabricated using a gravity and force feeder.

[1]**MEDELPHARM**
Application Laboratory
01700 Beynost (Lyon), France
www.medelpharm.com
contact@medelpharm.com