

STUDYING THE IMPACT OF LUBRICATION ON TABLET PROPERTIES USING STYL'ONE

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INTRODUCTION

Lubrication plays an important role during tablet manufacturing, especially during ejection and take-off. It reduces the friction between the tablet and the metal surface of the die and punches avoiding common problems as capping, lamination and adhesion to the tooling [1].

However, it is known that lubricants can have negative effects on tablet physical properties; they can interfere with the bonding forces of the particles to be compressed, and might also hinder water penetration, resulting in defects on tablet mechanical strength and dissolution properties [2,3].

The selection of the lubricant and its concentration, as well as the type, speed and time of blending need to be studied during tablet formulation. In the same way, the impact of the press feeding system on the powder lubrication must be evaluated early in R&D. All these parameters affect the lubrication process and consequently the tablet properties. In this context, Styl'One™, a uniaxial tablet press, permits to rapidly evaluate the impact of lubrication on tablet mechanical properties using only small quantities of powder.

The purpose of this work was to study the influence of the feeding system type on the tensile strength and the ejection force of different types of formulations lubricated with magnesium stearate (MgSt).

EXPERIMENTAL METHODS

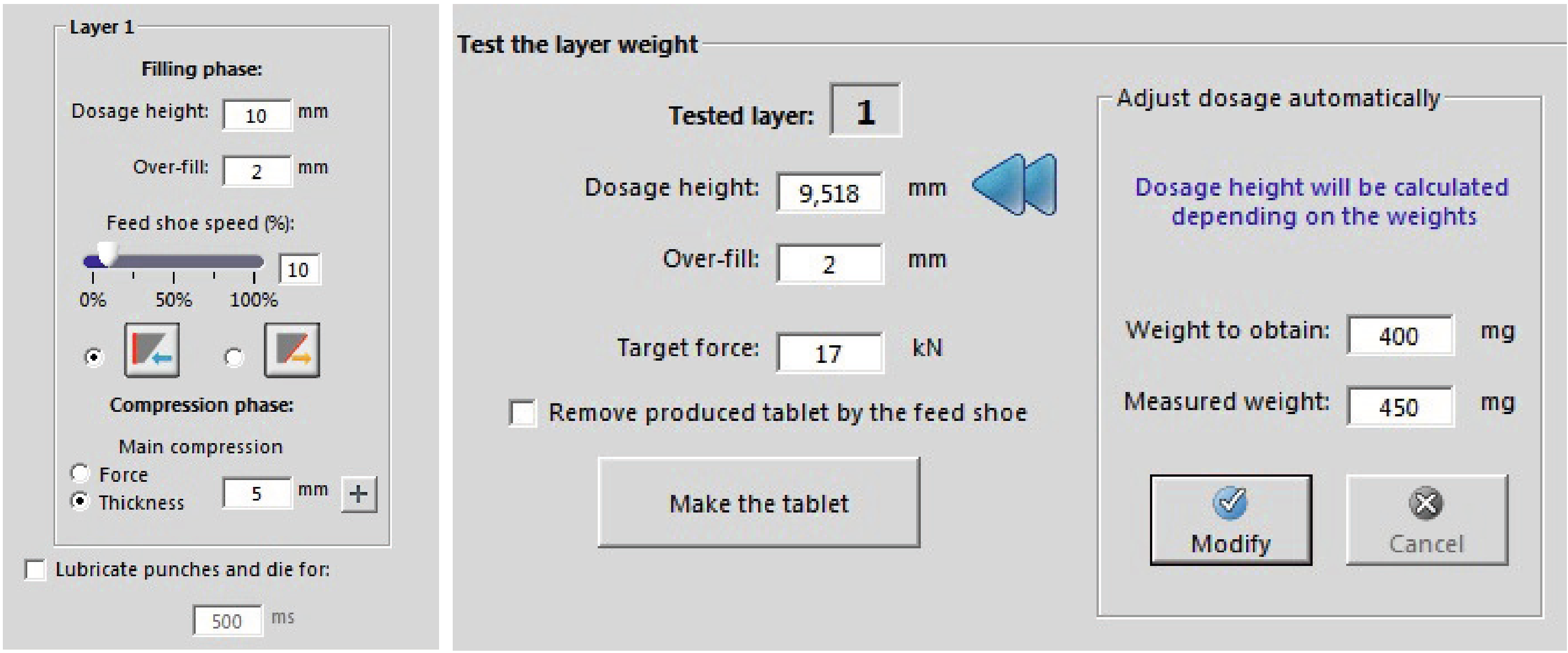


Fig. 2: Analisis™ acquisition software

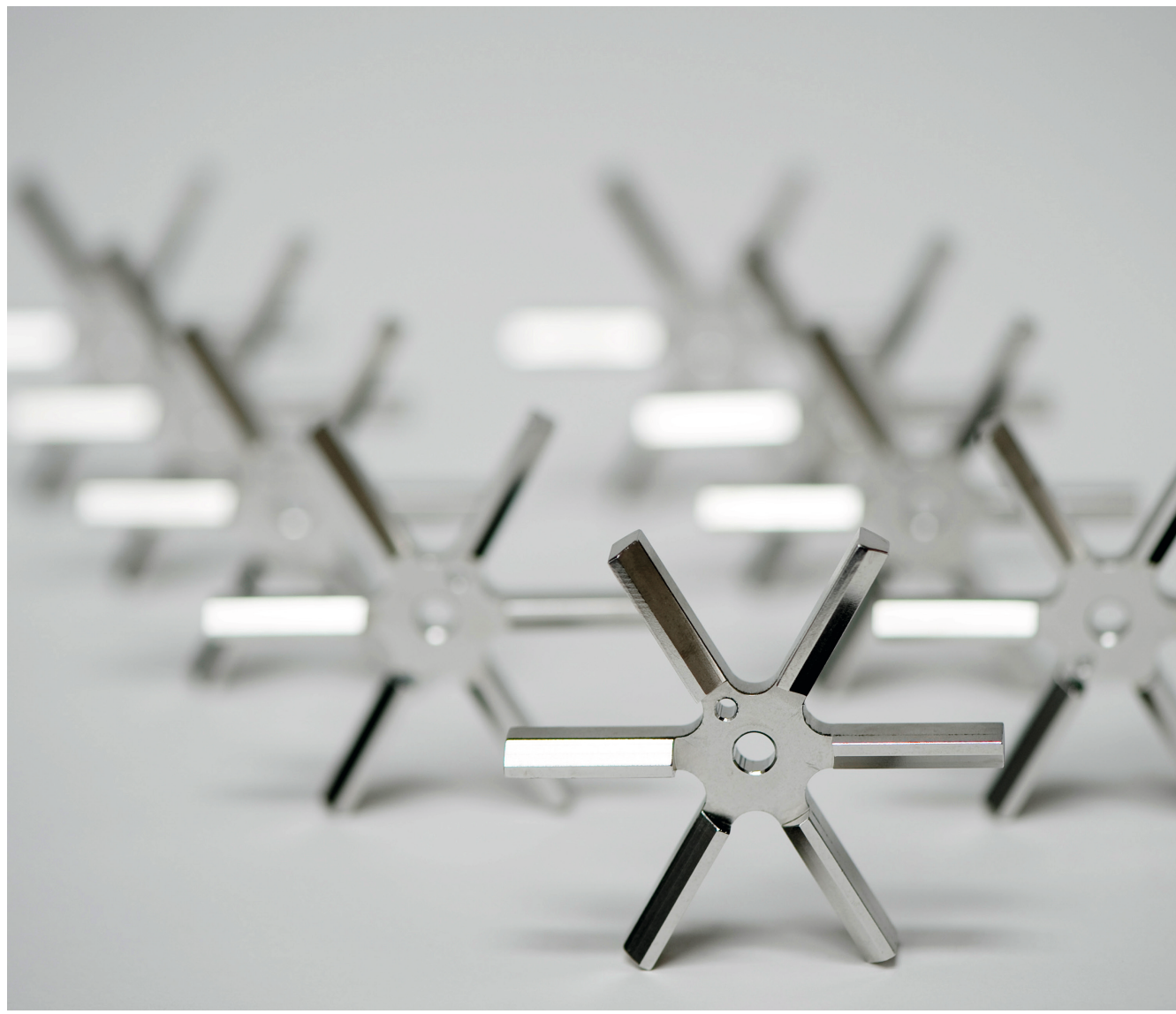


Fig. 1: Styl'One™ tablet press and feeding shoes

Tablets were made either with microcrystalline cellulose (MCC); lactose or a blend of MCC: lactose (30:70), all lubricated with 0.5% MgSt. Tablets were produced using a Styl'One™ (MedelPharm) (Fig. 1), equipped with Euro B 11.28 mm flat punches. Two types of feeding systems were used: a gravity and forced feeding shoe. The speed of the last one was set up at 10, 50 and 100% (24.5; 122.5 and 245 RPM). A study of the compression force was performed on Styl'One™ using the Analisis™ software (Fig. 2).

RESULTS AND DISCUSSION

The impact of the feeding type and forced feeding speed is less critical for lactose (brittle material) (Fig. 3) than for MCC (plastic material) tablets. Over-lubrication at high speed forced feeding causes a remarkable decrease on tensile strength of MCC tablets and the appearance of capping (Fig. 4). The use of external lubrication (punches & die) can avoid the tensile strength drop (Fig. 5). The ejection force can be used as an indicator of the tablet lubrication state (Fig. 6). If lubrication is not early optimized, severe production problems as powder sticking on punches & die, can occur.

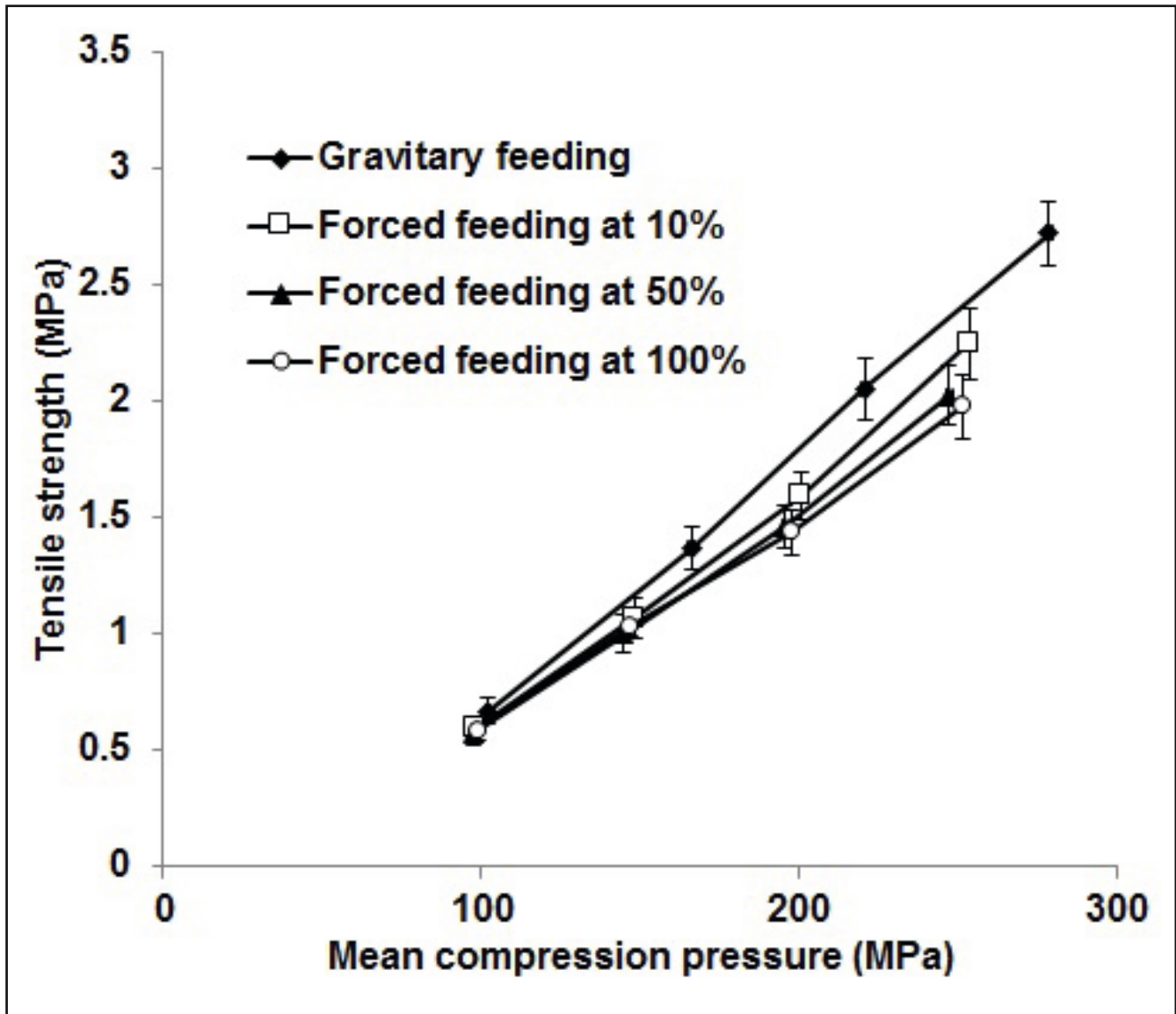


Fig. 3: Tensile strength of lactose tablets lubricated with 0.5% MgSt at different feeding shoe conditions

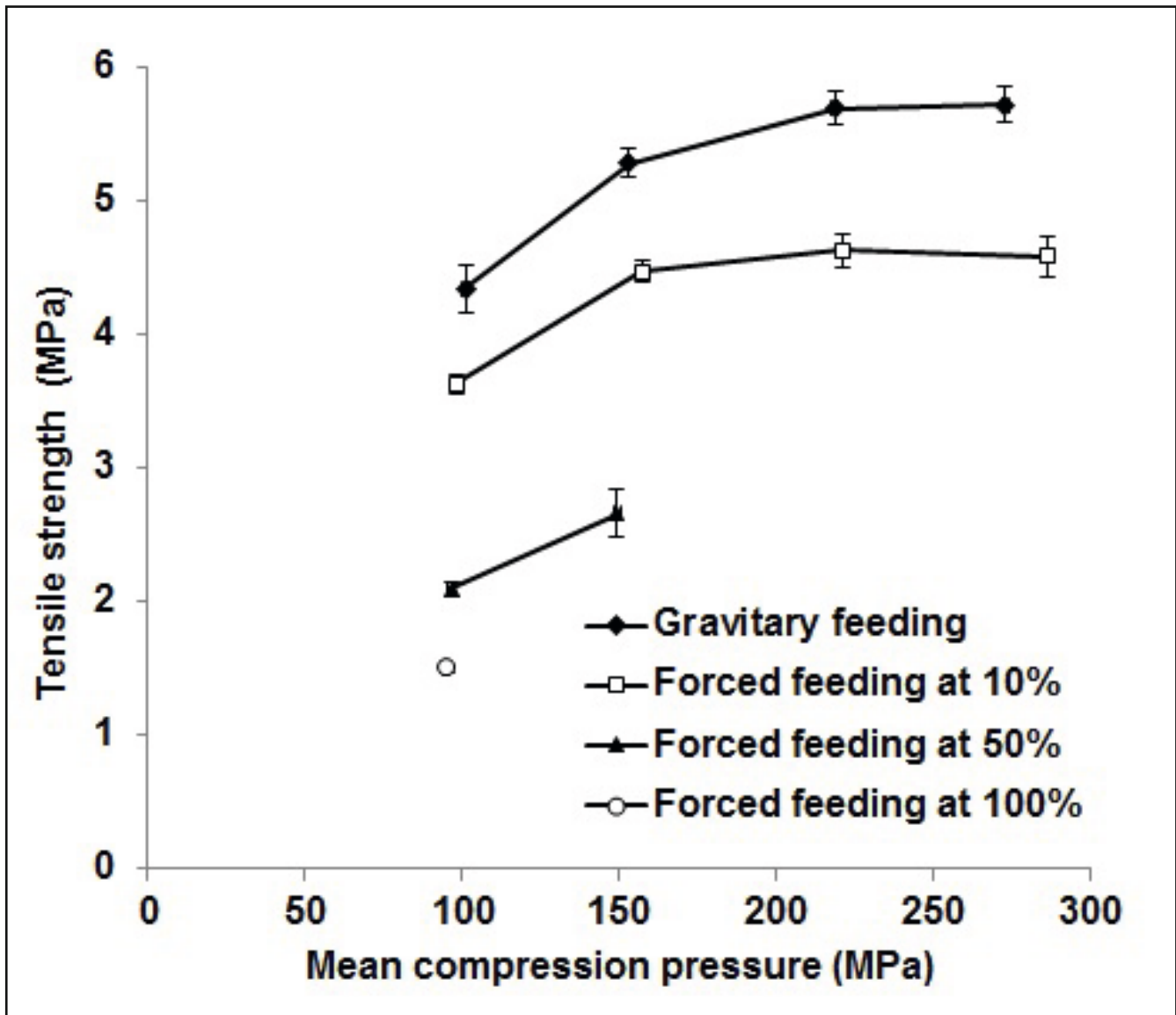


Fig. 4: Tensile strength of MCC tablets lubricated with 0.5% MgSt at different feeding shoe conditions

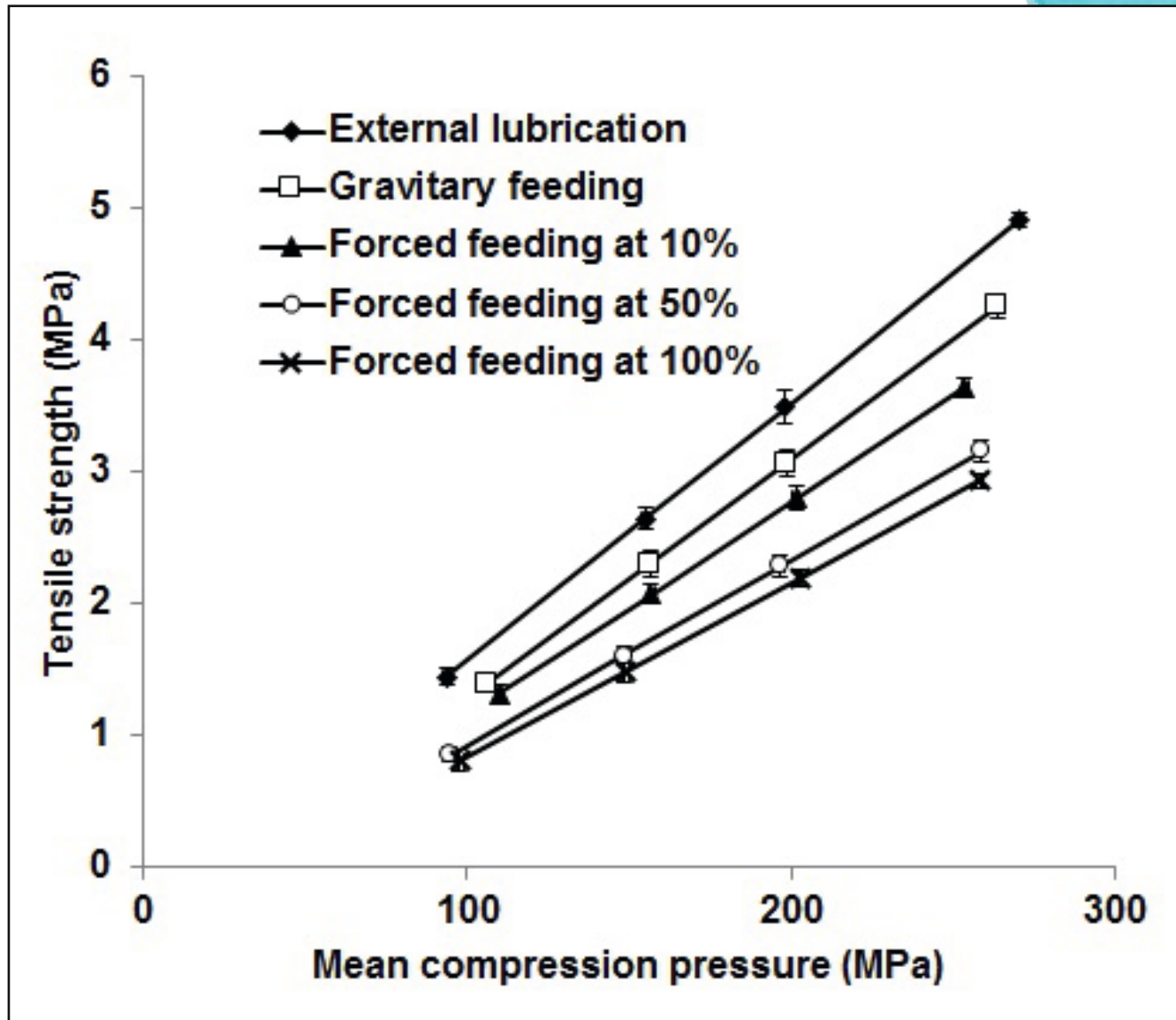


Fig. 5: Tensile strength of MCC:lactose (30:70) tablets with external lubrication and internal lubrication (0.5% MgSt) at feeding shoe conditions

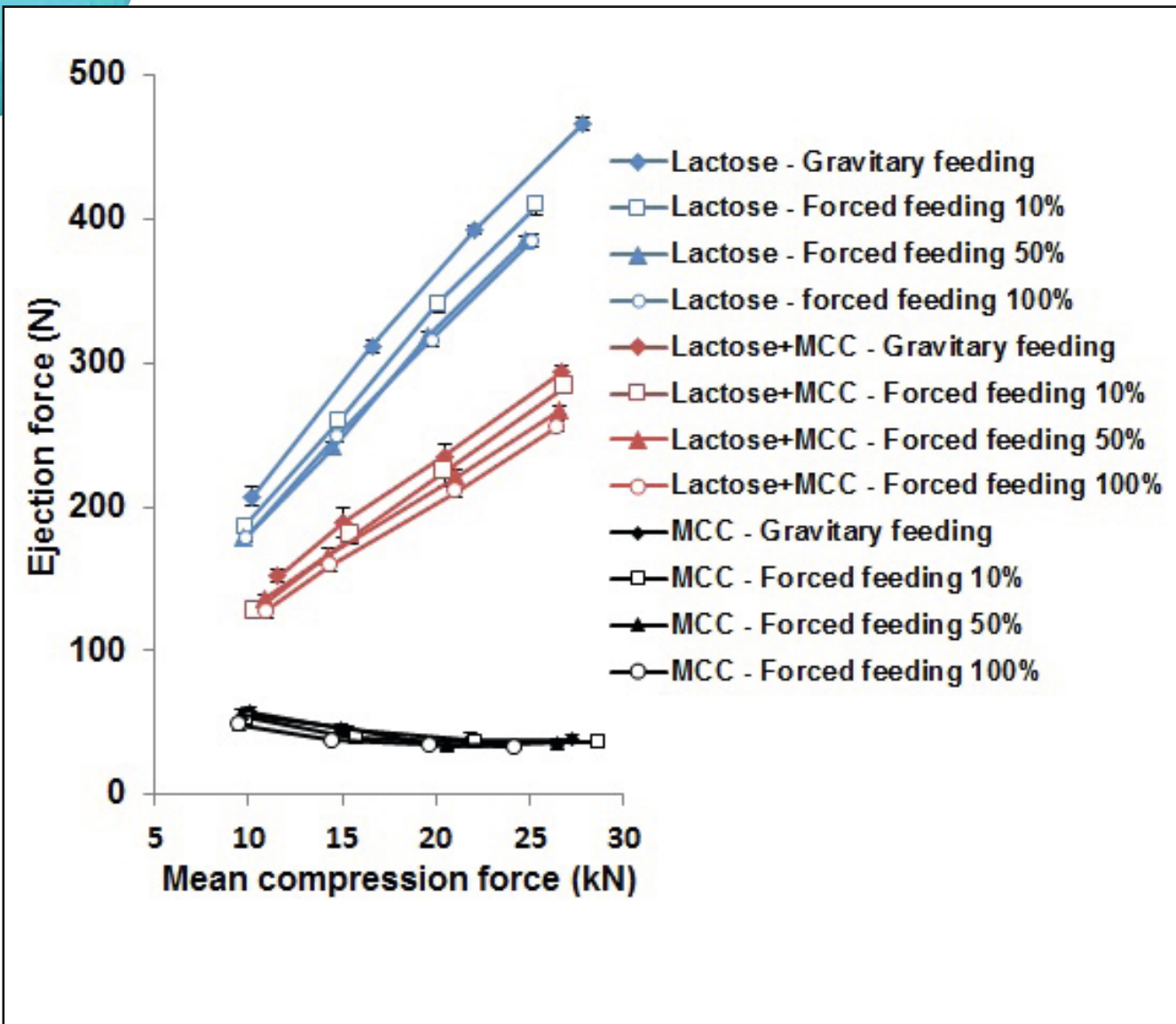


Fig. 6: Ejection forces of tablets made of MCC; lactose or a blend of MCC:lactose (30:70) at different feeding shoe conditions

CONCLUSION

Inadequate lubrication affect several tablet parameters. Over-lubrication has a negative impact on tablet tensile strength that could consequently lead to defects on tablet disintegration and dissolution.

Hence, it is important to choose the right type of excipient (brittle or plastic) and to consider the potential impact of the feeding type (gravitary or forced feeding) on tablet lubrication before to start a production process.

These parameters can be easily and quickly evaluated using a Styl'One™ compaction simulator during early R&D formulation to ensure appropriate tablet properties.

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