

## Sorbitol Special®

### Soft Gel Plasticizer: Improved Drying Times

The formation of a soft capsule requires the use of a non-volatile plasticizer in addition to water to guarantee the mechanical stability. Sorbitol Special Plasticizers are engineered to counter-balance the stresses during processing and drying.

The production of soft gels first includes forming the soft gel, then the tumble and tray dry processes to harden. The majority of the production process for soft gel capsules is drying time.

### Sorbitol Special MDF Drying Time in an Oil Filled Capsule

For most fill types, Sorbitol Special plasticizers can be used independently or with a glycerin system to reduce drying time.

Sorbitol Special and glycerin and a 50:50 combination were evaluated as plasticizers in capsules containing sunflower oil (model hydrophilic oil fill). The moisture level of the shell and the hardness development of the capsule with time was measured.

### Methods and Materials

Gel mass was aged for 17 hours to a viscosity between 8k-10k cps. Gelatin capsules were cast to 0.85mm thickness, 12 Minim ovals, and sealed at 35.5°C. Primary drying was done using a tumble drier for 60 minutes at 23°C and 32% RH. Secondary drying was done using tray drying for 72 hours at 20°C and 20% RH Sorbitol Special + glycerol were mixed at 1:1.

Hardness was used to indicate the drying endpoint. Assuming capsule hardness target of 20N, Sorbitol Special plasticized capsules reach drying endpoint at 56% of the time it takes for glycerol, which is significantly faster.

### Conclusion

50:50 combinations of glycerol and Sorbitol Special attain capsule hardness faster than glycerol alone. Sorbitol Special can be combined with glycerol to modulate the overall plasticizer content in the formulation.

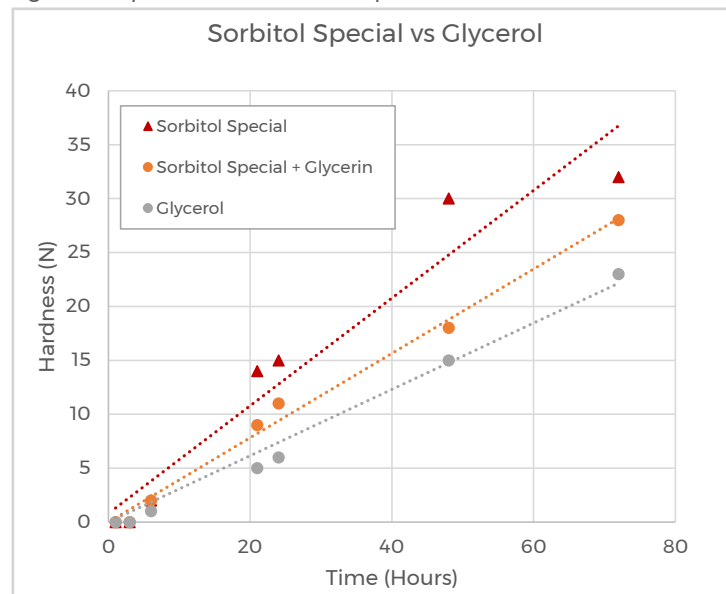
Table 1: Gel Mass Composition

Ingredients	% w/w
Gelatin (bloom 160)	40
Plasticizer	20
Water	40
<b>Total</b>	<b>100</b>

Table 2: Sorbitol Special Cuts Dry Time in Half

Plasticizer	Drying Time (Hours)
Glycerin	64
Glycerin + Sorbitol Special	56
Sorbitol Special	36

Figure 1: Capsule Hardness Development with Time



## Sorbitol Special MDF 85 Drying Time in PEG-Filled Soft Gels

Sorbitol Special MDF 85 and Competitor P were evaluated as plasticizers in capsules containing pure PEG (model hydrophilic fill). The processing and gel mass details are as given below. The moisture level of the shell and the hardness development of the capsule with time was measured.

### Methods and Materials

Gel mass was aged for 17 hours to a viscosity between 9k-11k cps. Gelatin capsules were cast to ~0.85mm thickness, 12 Minim ovals, and sealed at 36.5°C. Primary drying was done using a tumble drier for 60 minutes at 23°C and ~30% RH. Secondary drying was done using tray drying for 72 hours at 20°C and 20% RH.

Hardness was used to indicate the drying endpoint. Assuming target hardness of 20N, Sorbitol Special MDF 85 would reach the target hardness 33% faster than Competitor P. This model exhibits significantly faster drying times than commercially available formulations which often contain water/potassium hydroxide and API. The absence of water improves the drying rate. In all cases, Sorbitol Special drives the increased dry rate in direct comparisons.

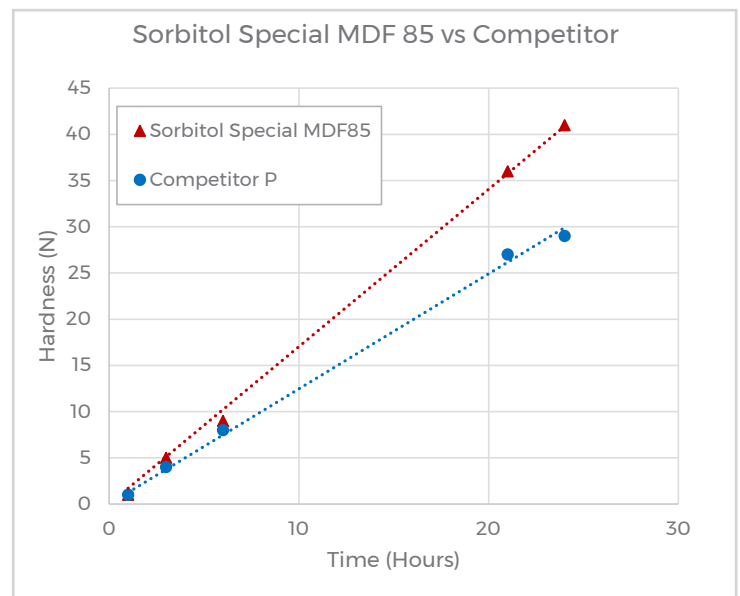
### Conclusion

For oil and PEG model fills, Sorbitol Special plasticizers, either independently or with glycerin, reduce drying times and beat competitive materials. This yields an increased number of capsules at a faster speed, driving productivity and profit.

Table 3: Gel Mass Composition

Ingredients	% w/w
Gelatin (bloom 160)	40
Plasticizer	20
Water	40
<b>Total</b>	<b>100</b>

Figure 2: Comparison of Capsule Hardness Development with Time



 SPI Pharma

 [salesinfo@spipharma.com](mailto:salesinfo@spipharma.com)

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