

Soya bean seeds: Does size really matter?

By Claudi Nortjé

Seed size has often come into question when its effect on the yield and overall performance of a plant has been raised. Since positive correlations between seed size and yield in a variety of crop species have been reported, researchers have conducted similar studies on soya beans. According to a study conducted by the American Society of Agronomy, which was published in *Agronomy Journal*, seed size has little to no effect on a soya bean plant's mortality, lodging, or the size of harvested seed.

The study found that when larger and smaller soya bean seeds were planted in the same row, the progeny from the larger seed produced more yield compared to that of the smaller seed. Ultimately it was found that the impact of seed size on progeny performance was a response to relative seed size within a population, and not a response to seed size per se.

Seed weight vs count

Another study done by the University of Missouri found that soya bean seed size does not affect yield performance at all. According to the study, this finding may prompt industry role-players to restructure the way soya bean seed is

sold. While discussions about selling soya bean seed by count, as opposed to weight, have been doing the rounds for years, the study points out that this practice is not yet the norm.

Seeing that soya bean seed is usually sold in bulk and priced according to weight, variations in seed size translate into changes in the number of seeds per bag. For instance, if soya beans were a little bit smaller than normal and equalled 3 200 seeds/pound, instead of the average 2 800 seeds/pound, a 50-pound bag would contain 160 000 seeds. This translates into 20 000 more seeds compared to the average 140 000 seeds per 50-pound bag. Seed size can vary according to seed variety, but is also impacted by various environmental factors.

According to the study, farmers may deliberately choose soya bean varieties with a smaller seed size as they would end up purchasing a lot more seeds at no extra cost. By doing this, producers can lower seed costs per acre if they calibrate their planters by seed count and not weight. For this reason, soya bean producers may be reluctant to purchase seed by count instead of weight.

Although neither method is promoted in the study, it does highlight one

advantage of buying soya bean seed by seed count: If planters are calibrated according to the number of seeds instead of their weight, farmers can determine exactly how much seed they need to purchase of each soya bean variety. This can help producers to save on soya bean seed costs and can reduce the amount of seed that needs to be returned after the planting season. Treated seed is more difficult to return due to its usage limitations. However, protecting seeds with seed treatments is becoming more common as the price for soya bean seeds is increasing.

The University of Missouri states in their study that if the seed industry were to purchase seed by count instead of weight, it may shift the focus to the characteristics of the different soya bean varieties.

Selecting the right cultivars

When it comes to choosing between soya bean varieties and determining the profitability of soya bean production, resistance to diseases and pests, as well as yield potential should outweigh the importance of seed size.

The study states that in most cases the size of soya bean seeds does not affect emergence percentage, seedling vigour or

yield potential. One thing that producers should keep in mind, though, is that smaller seeds have less stored reserves, which means that planting depth can play a key role in successful germination and ultimately crop yield. If soya bean seeds are small due to early maturity, they may be less vigorous than normal; however, apart from these factors, seed size should not play a distinctive role in variety selection.

Causative factors

The seed size of soya beans is largely dependent on two factors, namely the genetic tendency of the seed variety and the growing conditions that seed are exposed to. Factors such as excessive stress or optimal rainfall conditions from the R6 growth stage onwards can have a huge impact on the size of soya beans.

According to a study published in *Journal of Seed Science*, the level of soil fertility also plays an instrumental role in the ability of seeds to express their potential vigour, which may ultimately influence crop productivity. In terms of essential soil nutrients, phosphorus is a key driver of various metabolic processes in soya bean plants. These processes include the transfer of energy, respiration, photosynthesis, synthesis and stability of cell membranes, synthesis of nucleic acids and glucose, and the activation and deactivation of various enzymes.

When seeds are exposed to optimal growing conditions with enough rainfall, it usually encourages the formation of



Studies found that the impact of seed size on progeny performance was a response to relative seed size within a population, and not a response to seed size per se. (Photograph: United Soybean Board)



The study found that some farmers deliberately choose soya bean varieties with a smaller seed size, ensuring more seeds at no extra cost, as well as lower seed costs per acre if they calibrate their planters by seed count and not weight. (Photograph: United Soybean Board)

more pods. Then again, if soya bean plants that already have above-average pod sets experience a decrease in rainfall during the R6 as well as subsequent growth stages, the resulting seeds are usually smaller or normal sized. If soya beans are grown in drought conditions, the size of the seed will be smaller with an overall reduced number of seeds per plant.

If plants have already decreased their total number of pods due to drought exposure in the initial growth stages, seed sizes can become bigger if the plants are exposed to increased rainfall. In other words, plants can recover exceptionally fast if exposed to rainfall after experiencing initial moisture stress. However, due to an already-decreased pod set, the plant's normal photosynthetic capacity will then result in very large seed.

Seed size and yield potential

In extreme circumstances soya bean seed size can affect germination and emergence, but generally speaking seed size does not affect yield potential. In dry soil conditions, smaller soya seeds have better emergence than larger seeds as larger seeds need more energy to emerge from the soil. For this reason, larger seeds have a bigger energy reserve that can help them to successfully navigate adverse growing

conditions for longer periods prior to emergence compared to smaller seeds.

One study conducted by Agriculture and Agri-Food Canada (AAFC) found that while some field trials showed that soya bean plants originating from large seeds had significantly greater yield than those from small seeds, others indicated no correlation between seed size and yield if plots were grown at consistent population densities.

Most of the experiments in this study were conducted in greenhouses or in warm climates where the conditions at germination and the early development of plants were optimal. The results also showed that smaller seeds had a higher plant emergence in light-textured soils, while larger seeds had greater emergence in heavy-textured soils. Yet the differences in plant emergence did not produce significant yield differences.

Another study published in *International Journal of Agronomy* found that although researchers noticed improved germination of small- and medium-seeded varieties in laboratory settings, the inherent field moisture present when planting seeds may play a more important role than seed size when it comes to germination and emergence. 🌱

For a list of references, send an email to the author at claudi@plaasmedia.co.za.