European Journal of Agricultural and Rural Education (EJARE)
Available Online at: https://www.scholarzest.com
Vol. 3 No. 5, May 2022
ISSN: 2660-5643

EFFECT OF SEED SIZE ON SEEDLING VIGOR AND SEED YIELD IN VEGETABLE SEED PRODUCTION: A REVIEW

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Article history:
Received: 15th April 2022
Accepted: 18th May 2022
Published: 20th May 2022

Abstract:
Seed size influences vegetative growth and is frequently linked to yield. Market circumstances and the harvest's success Seed size varies between species due to genetic variability. Extra-large, large, medium, small, and extra small are the five seed sizes available. This variation is caused by the passage of nutrients through the seed in the mother plant. Food reserves are accumulated later because the seed coat and embryonic axis mature first in the seed inside the capsule. The filling of food stores for later seedling growth is affected by this size disparity. In various crop varieties, seed size has been proven to have a variety of effects on seed germination, emergence, and other agronomic aspects. In the field, broad seeds perform better than microscopic seeds.

Keywords: Seed size, Seedling Vigor, Seed Yield.

INTRODUCTION

High-quality seed is important for excellent agricultural yields, as it increases productivity by 20-25 percent. This surge's size is proportional to the seed's consistency. Depending on the production climate and growth methods, the size, weight, and density of seeds in a seed lot may vary. To develop a profitable plantation, you'll need healthy nursery seedlings or stocks. Seed viability and size may also have an impact (Kadambi, 1972). Because of their sizes, the hard seed coat, a hereditary property of these seeds' dormancy, seed storage duration, and poor seed collecting timing may all contribute to the germination rate of particular seeds (Nwoboshi, 1982). According to Ganzalez (1993), seed size influences plant vigor, with larger seeds producing more vigorous plants. One component of seed quality that determines crop production is seed size (Simmone et al., 2000; Ojo, 2000, Adebisi, 2004; Adebisi et al., 2011). Large seeds have a high rate of seeding survival, growth, and establishment, which is a standard metric for seed quality (Jerlin and Vadivelu, 2004). Many crop species have observed seed size effects on seed germination, emergence, and other agronomical characteristics (Kaydan and Yagmur, 2008). However, the results varied widely amongst organisms. Broad seed performs better in the field than small seed in general. The vast majority of crops grown throughout the world start with a seed planted in the ground to grow into a new plant. The earliest and most critical step in crop development is seedling establishment, as it determines whether or not the harvest will be successful. Seed quality is a vital attribute for seed production and food security, especially in light of climate change's increased unpredictability. In order to measure crop viability and its environmental impact, we explain how seed quality has a direct impact on performance, production performance, and resource utilization efficiency. High seed quality is vital for crop production to be both viable and productive, and it is widely regarded as an essential agricultural trait, from resource-poor farming to industrial farming.

LARGE SEED'S EFFECT ON SEEDLING VIGOUR:

The size of the seed determines how strong it is. Large seeds result in stronger seedlings (Ries and Everson, 1973). Germination rate and seedling vigor index values improved as seed size increased, indicating that larger seeds should be used to establish a strong foundation (Roy et al., 1996). Larger seeds create more strong seedlings, while smaller seeds yield smaller seedlings (Cookson et al., 2001). Large seeds (3.1 mm rectangular sieve), medium seeds (3.1 mm rectangular sieve), and small seeds (went through 2.10 mm) produced plants with higher plant height (98.83 g), leaf number (7.80), and stem circumference (7.98). Small (3.1 mm) seeds produce a Cm plant (90.60, 6.63, 6.40 cm, respectively). Nagaraju (2001) discovered that large seeds (87.19 percent, 22.44 cm, 1941,0.26 mg, and 77.93 percent) had higher germination percentages (93.98 percent), seedling length (25.28 cm), seedling vigour index (2379), dry weight (0.26 mg), and field emergence than small seeds (87.19 percent, 22.44 cm, 1941,0.26 mg, and 77.93 percent) (84.00 percent). According to Nerson (2002), small muskmelon seeds exhibited the lowest percentage of germination,

emergence, and seedling growth, suggesting that seed physical attributes and seed quality are linked. "When compared to other 13/64", 13/66", and 11/66" sieves, the round perforated metal sieve had greater germination (96%), vigour index (1362), and productivity ("When compared to other 13/64", 13/66", and 11/66" sieves, the round perforated metal sieve had higher germination (96 (900 kg ha^{-1}) Balamurugan and colleagues (2004) In all types of seeds, large seeds had a higher seedling vigour index than small seeds; nevertheless, there were only minor differences across seed grades in some varieties (Verma et al., 2005). With increased sieve size, Vishvanath et al. (2006) found that quality measures such 100-seed weight, field appearance, seedling length, and vigor index were significantly higher. According to Suresha et al. (2007), the larger size seeds germinated at a higher rate (99%) than the smaller size seeds. Sulochanamma and Reddy (2007) discovered that shrivelled and tiny seeds produced fewer seedlings than bold seeds in groundnut. Bold seeds produced 35.1 percent more aberrant seedlings than tiny and shrivelled seedlings (10.8 percent). In times of stress, large seeds are chosen, according to some researchers (Hanley et al., 2007). Larger seeds germinate faster and require less time than smaller ones (Gunaga et al., 2007).Larger seeds have better physiological quality, according to (Menaka and Balamurugan ,2008). Triticale germination and emergence were found to be improved with larger seed sizes (Kaydan and Yagmur, 2008). Seed size and mass had an impact on the appearance of Hypatis suaveolous, according to (Mandal et al. 2008). Large seeds have a larger emerging potential than small seeds. Larger seeds are more able to emerge from deeper planting depths, penetrate ground cover, and withstand litter burial than smaller seeds (Mandal et al., 2008).
Table 1 shows the effect of seed size on pumpkin germination days, seedling height, and leaf number (T. occidentalis.)

Treatments (Seed sizes)	Days to first germination	Seedling height (cm) @ 2WAS	Number of leaves @ 2 WAS
Big seeds Small seeds	11.33a 10.75b	29.8a 26.6b	8.52 8.33
LSD(0.05)	0.55	2.33	1.42

*** WAS = Weeks after sowing. Means followed by the same letter within column are not significantly different at 5% probability level using F-LSD.(From Ndor et al., 2012).**

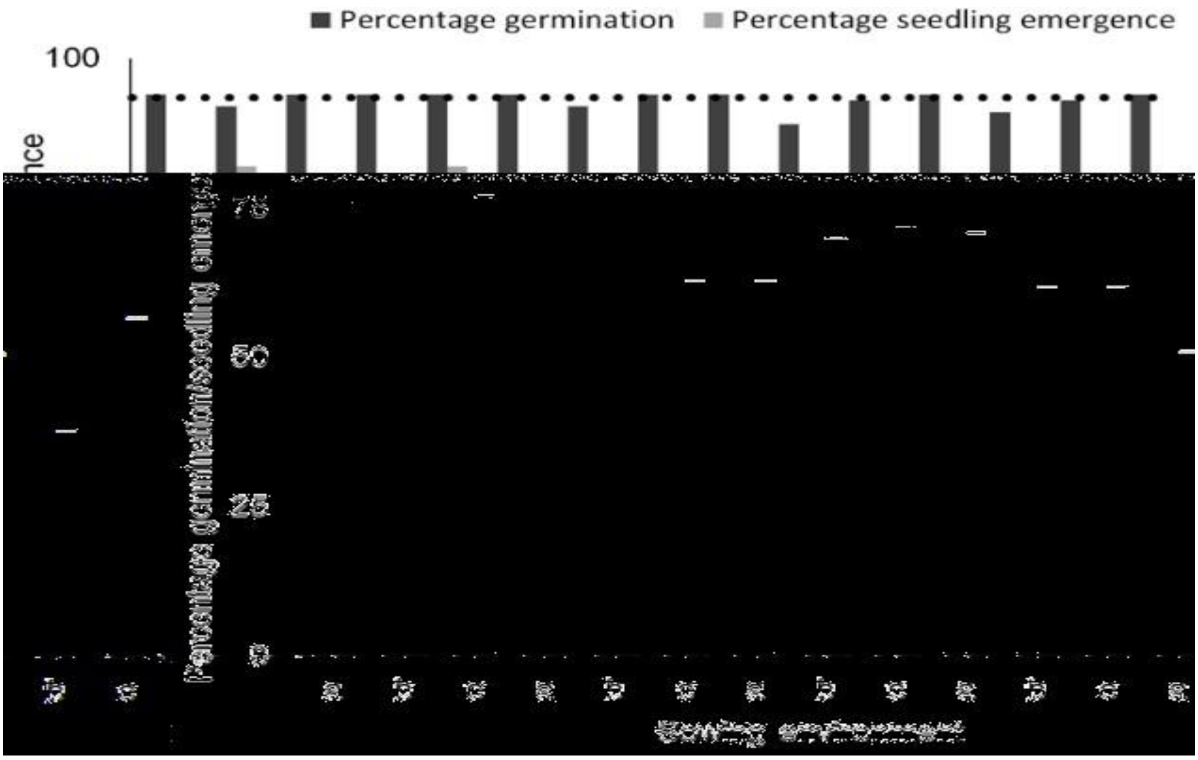


Figure1: Percentage of germination/seedling emergence.

When huge seed is compared to little seed, large seed has a larger germination percentage and a faster germination rate (Gholami et al., 2009). "Maximum germination, seedling vigour, protein content, dehydrogenase activity, and alpha-amylase activity were all measured using round perforated metal sieves on 20/64." (Anuradha et al., 2009). In safflower, little seeds (75 percent) took in less water than large seeds (85 percent) Jute cv. JRO 528 and JRO 8438 seeds analyzed

using BSS 16x16 sieves had enhanced seed quality standards, according to Motamedi and Farhoudi (2010, Farhoudi and Motamedi) (Jerlin et al., 2010).
Of all the NaCl levels studied, seedlings from small seeds had the highest Na+ and Cl content. Due of decreased ion accumulation under NaCl stress, large seeds promoted rapid seedling growth (Mehmet et al., 2011). Plants with large seeds are more robust and generate more dry matter than plants with small seeds (Nik et al., 2011). Seed weight has a substantial impact on germination parameters, according to Hojjat (2011), Large seeds of lentil genotypes sprout earlier and have better germination than small seeds. Larger seeds, which contain more carbohydrates and other nutrients, are more likely to germinate quickly and efficiently than medium and small seeds (Gunaga et al., 2011). Small seedlings generated seeds with a low vigor index of 303.38, while large fluted pumpkin seeds produced seedlings with a very high vigor index of 322.35. (2012) (Ndoor and colleagues). According to Aherwar (2012), the largest germination of Alangium lamarckii Thwaites seeds had the highest germination (78.00%), followed by medium-sized seeds (75.00%), and small-sized seeds (70.00%). (0.00 percent). (60.00 percent).

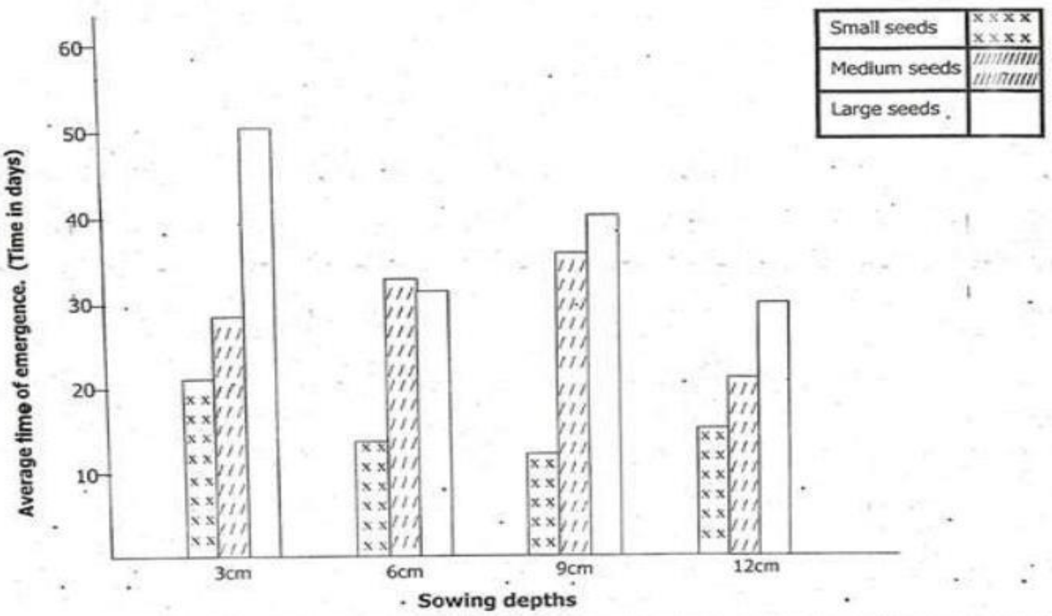
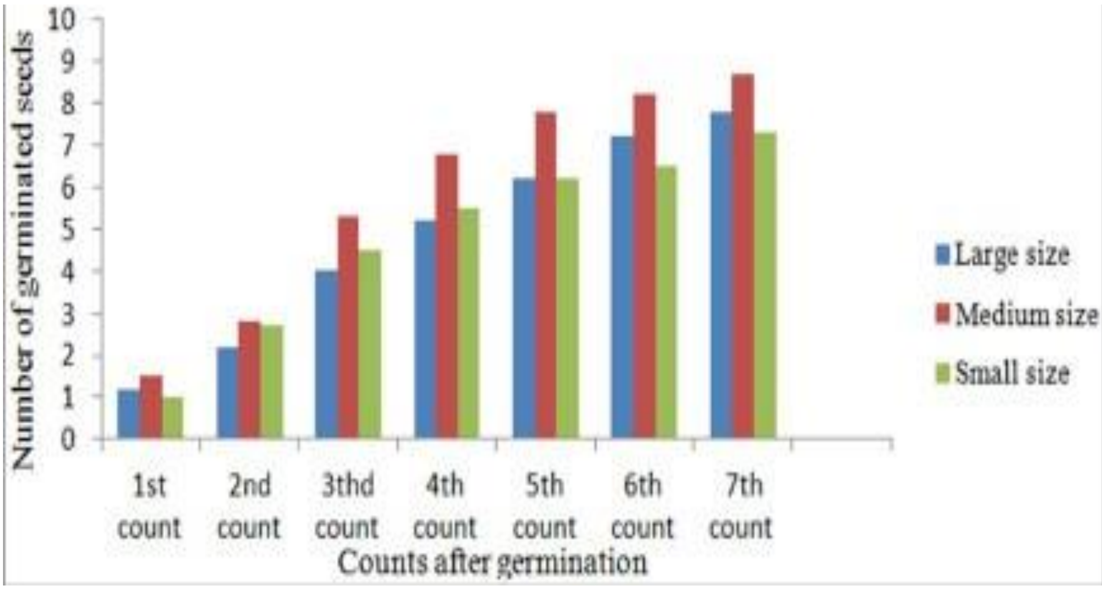


Figure 2: Effect of four different sowing depth (3, 6, 9 , 12 cm) on emergence of three seed size of Telfairia occidentalis growth in the field(from Umeoka and Ogbonnaya , 2016)



LARGE SEED EFFECT ON SEED YIELD:

Larger seeds provided higher yields than smaller seeds under late planting conditions (Singh and Kailasanathan, 1976), but not under perfect management conditions (Kalita and Choudhury, 1984).Seed size influences not just emergence and establishment, according to Baalbaki and Copeland (1997). Seed size has a considerable impact on germination, plant development, and biomass increment, according to (Simmone et al., 2000). Large seeds (retained over a 3.00 mm sieve) resulted in a bigger head diameter (15.00 cm), According to the study, the total number of seeds per head was 619.51, the percent seed filling was 84.22, the seed yield per plant was 22.41 g, and the seed yield per hectare was 10.97 g. (Nagaraju ,2001). (Passed through a 2.8 mm filter). Munir and Abdel-Rahman (2002) found that seed size had minimal effect on plant height, primary branch per plant, or seed yield in the faba bean. Wheat will compete more effectively with a larger seed size and higher planting rates, but wild oat biomass and seed yields will be reduced (Xue and Stougaard, 2002). In all eight genotypes of pigeonpea, the ungraded and broad seed classes surpassed the tiny seed grade in terms of yield and primary branches per plant (Verma and Bajpai, 2002). Seed size has a significant impact on seed yield, according to (Kumar and Seth, 2004). Small seed yields were equivalent to medium, bold, and ungraded seed yields, although medium seeds yielded significantly more. Because there are fewer seeds, they are tiny.

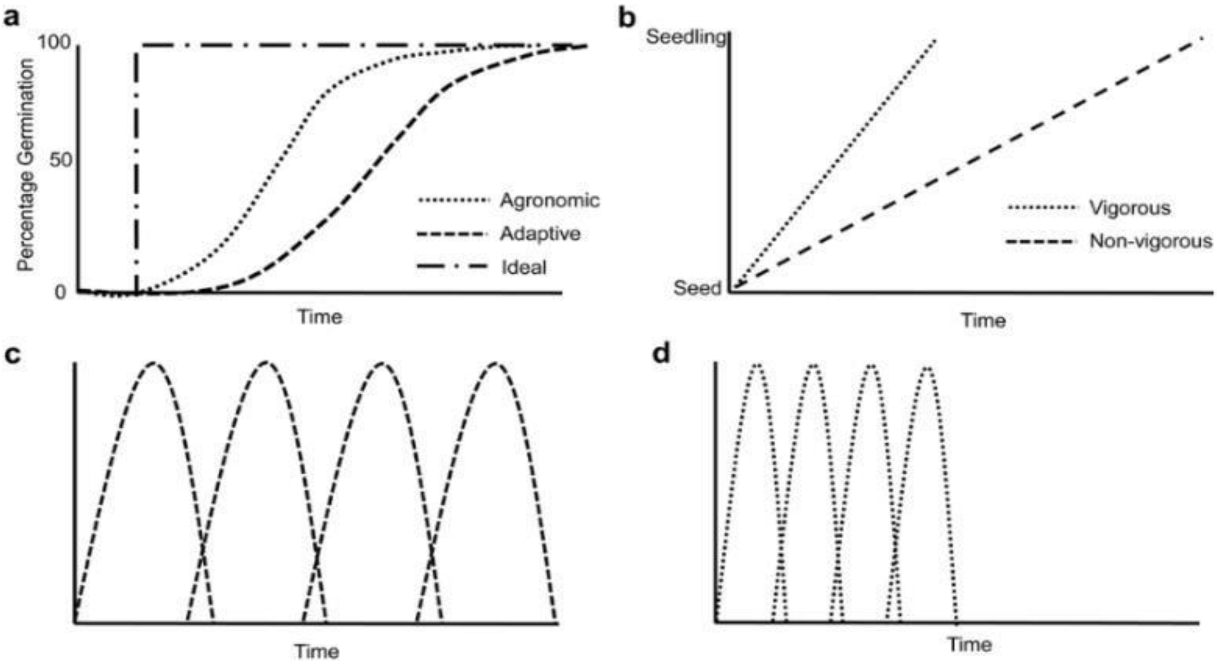


Figure 4 : Germination percentage of vigorous and non-vigorous according to the time.

Plants developed from broad seed have more vitality and may store a higher percentage of plant growth components than plants grown from narrow seed (Stougaard and Xue, 2004). According to the researchers, plants grown from heavier seeds had a 100 seed weight that was 12% higher than those generated from lighter seeds (Tawaha and Turk, 2004). Potatoes can be grown using more than 1 g seedling tubers, as well as seed tubers from any typical kind (Adhikari, 2005). In a comparable study, it was discovered that utilizing larger seed sizes boosted grain yields by 19%, whereas using small seeds reduced production by 18%. (Stougaard and Xue, 2005). Santosh et al. looked into the influence of soybean seed size on physiological efficiency during storage (2005). According to several studies, huge seeds produce more yield in cereal crops than tiny seeds (Anonymous, 2005). According to research, larger seeds could enhance production by 18%. (Stougaard and Xue ,2005).

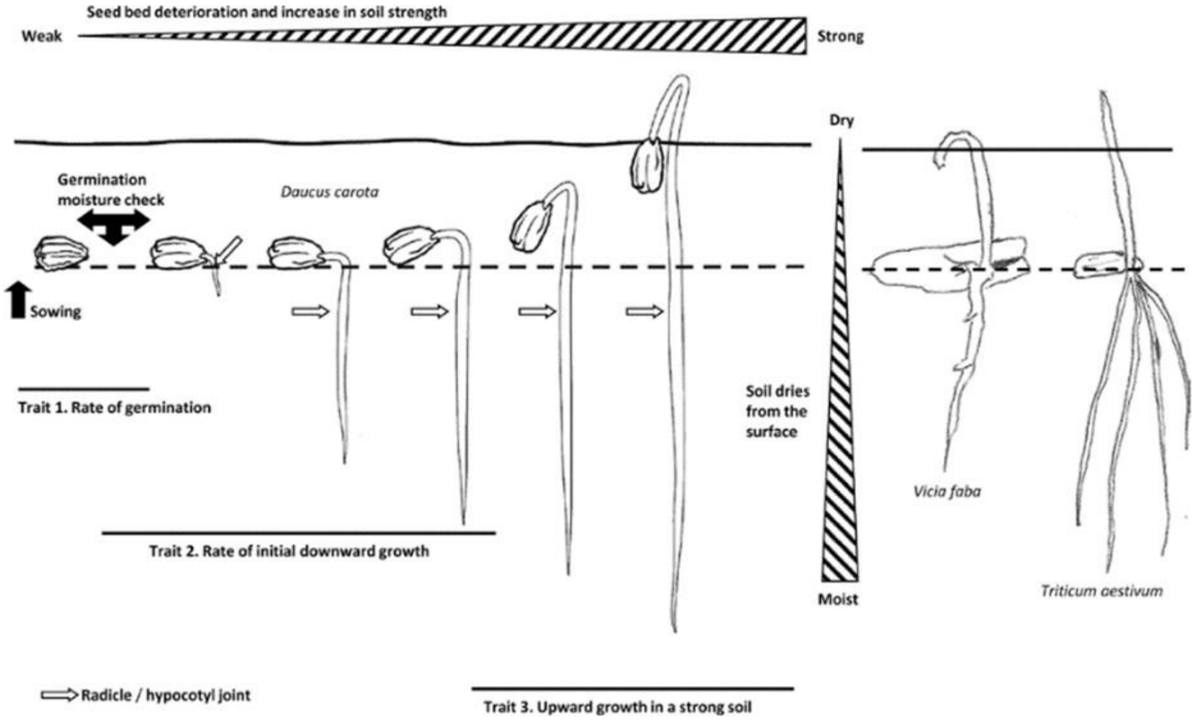


Figure 5: Seed germination and seedling emergence as a function of seedbed conditions.

Large seeds store more food for embryo development and production, leading in rapid seedling growth until weeds emerge and compete. Lima et al. (2005) discovered that plants grown from large seeds grew at a higher rate of growth at the start of the cycle. In French bean cv. Seeds with a diameter of >4.38 mm, rather than seeds with a diameter of >4.80 mm, may be used for higher field efficiency, according to Yogeesha et al. (2005). In mustard, seed size had a substantial impact on yield attributing factors, with higher values in the broad seed size group. Small seeds produced fewer seeds seeds that are medium, big, or unscreened (Morrison and Xue, 2007). Leaf area was influenced by crop size disparities. Large seeds produce increased leaf area, according to Khurana and Singh (2000). Large seeds boosted the amount of leaf area produced by Abizia plants, especially early in the growth cycle (Khurana and Singh, 2000).
Crop size had a substantial effect on emergence and overall marketable production, according to (Upadhya and Cabello, 2000), and seedlings grown from larger seeds had greater survival and overall tuberculosis in Irish potatoes (Solanum tuberosum). Young seeds, according to Elliott et al., (2008) produced seedlings with decreased vigor. Medium seed plants generated 7% more than large seed plants (Bicer, 2009)

Figure 6: Seed vigour variations create differences in field efficiency.

Plants grown from little seed are expected to have fewer fertile tillers than plants grown from large seed since the emergence of the smallest seed size was the lowest. Grain yield and biological yield both dropped at the smallest seed scale. Larger seed sizes resulted in more plants and a higher biological yield (Zareian et al., 2013). Small seed size tropical soybean lots had the best seed germination (98 percent) and emergence (92 percent), According to Adebisi et al., big seed size lots had the most seed (87) per plant, pods (55) per plant, and seed yield (9.78 g) per plant (2013).

SMALL SEEDS HAVE AN IMPACT ON SEEDING ACTIVITY:

Small to medium-sized seeds had increased germination and seedling vitality than bigger seeds, according to Dar et al. (2002). Bixin et al. (2004) discovered that cultivars with smaller seeds had a greater germination rate than cultivars with larger seeds in pea cultivars (Pisum sativum L.). The unsorted seed type was also found to be superior at sowing than the small seed scale in mustard (Kumar et al., 2005). Young seeds sprout and grow faster in salty soils, according to Farhoudi and Motamedi (2010), and may be preferable for usage in saline soils to generate superior carriers.

CONCLUSION

The impact of high seed size on plant development is overwhelmingly positive. Larger plant seedlings develop faster, are larger, and have more nutrients available. Large seeds help seedlings survive typical problems such as herbivores, dryness, and shadow. Nutrient availability is increased via faster emergence and bigger seedlings. Large-seeded species seedlings will receive more light and/or a steady source of water than small-seeded species seedlings. Rapid emergence produces big seedlings, which provide better nutrient access to deeply planted plants due to larger root diameters and faster nutrient utilization. Small seedlings vying for the same resources will only receive a fraction of the nutrients they require to live, but larger seedlings will develop root systems and have easier access to light.

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