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# Seed weight and Morpho-physiological parameters in Mango (*Mangifera indica*) seedlings

## Težina sjemenki i morfo-fiziološki parametri klijanaca manga (*Mangifera indica)*

**K.S. Olorunmaiye, P.O. Fatoba, P. M. Olorunmaiye, Adeyemi C. OreOluwa**

## ABSTRACT

Seeds from a local variety of Mango (*Mangifera indica*) were collected shortly after the seasonal fruiting period between March and May, 2009. The seeds were sorted into four groups tagged, very heavy, heavy, medium and light (25-32, 20-24,16-19 and10-15g) respectively. The study investigated the effect of seed weight on the number of seedlings per seed, stem height, number of leaves, and seedling dry weight. The results showed that the seed weight influenced the various morpho-physiological parameters studied though, not statistically significant. However, the results of this study showed that a group (HYS) among the heavy seeds category produced more than one seedling per seed, while another group (VHS) of heavy seeds produced only one seedling per seed like other groups of seeds. Greater stem heights were obtained from the seedlings of heavy and medium weights seed groups, while the shortest stem height was obtained in medium and light seeds. Seedling dry weights were much higher in heavy and medium weights seeds than light seeds

Key words**:** Mango, seedlings, Stem height, dry weight, Seed weight**.**

## SAŽETAK

Sjeme lokalnog kultivara manga (*Mangifera indica*) sakupljeno je odmah nakon sezonskog razdoblja zriobe, između ožujka i svibnja 2009. godine. Sjeme je sortirano u četiri skupine i označeno: vrlo teško, teško, srednje i lagano (25-32, 20-24, 16-19 i 10-15 g). U radu je istraživano djelovanje težine sjemena na broj klijanaca po sjemenki, visinu peteljke, broj listova te suhu težinu klijanaca. Rezultati su pokazali da je težina sjemenki utjecala na razne istraživane morfo-fiziološke parametre, iako statistički ne značajno. Međutim, rezultati ovog istraživanja pokazali su da je skupina (HYS) među sjemenkama teške kategorije dala više od jednog klijanca po sjemenki, dok je druga skupina (VHS) teških sjemenki dala samo jednog klijanca po sjemenki, kao ostale skupine sjemenki. Veće visine stabljike dali su klijanci skupina teške ili srednje težine sjemenki, dok je kraća visina peteljki dobivena od srednjih i laganih sjemenki. Suhe

težine klijanaca bile su više u sjemenkama teže ili srednje težine nego u laganih sjemenki.

Ključne riječi: mango, klijanac, visina peteljke, suha težina, težina sjemenke

## INTRODUCTION

Mango belongs to the family *Anacardiaceae.* It is a deep-rooted, evergreen plant which can develop into huge trees, especially on deep soils. The height and shape varies considerably among seedlings and cultivars. Under optimum climatic conditions, the trees are erect and fast growing and the canopy can either be broad and rounded or more upright (Salim.et al., 2002). It is arborescent with leaves alternate, petiolate and entire. Mango fruit is the fruit of the masses (Opeke, 1987).

Mango can be propagated by seeds or by grafting. For commercial purpose, grafting is the most appropriate method because it maintains the genetic characters from the propagated variety (Cordeiro et al., 2006) seed propagation is however, easier and cheaper (Opeke,1987).

The mango (*Mangifera indica*) is a tropical arborescent species of great economic importance. Among tree fruits, the value of mango production ranks fifth between apple and pear (De Laroussilhe 1980). Low yield of Mango in the tropics is most often attributed to the failure of flora induction while in some tropical areas, flowering is usually reliable but fruit set is always poor (Whiley, 1992). Mango occupies 42.6 % of the total fruit crops areas in India, with an annual production of over 10.99 Metric tons (Saini and Singh, 2001). Mango is predominantly grown as a cash crop. Nutritional value per 100 g is 250 kJ (60 kcal) and that of the apple mango is slightly higher (79 kcal per 100g). Mango contains a variety of phytochemicals (Ajila and Prasada, 2008). The fruit pulp is high in prebiotic dietary fibre, vitamin C, diverse polyphenols and provitamin A carotenoids. (USDA, 2010)

In mango fruit pulp, the antioxidant vitamins A and C, Vitamin $B_6$ (pyridoxine), folate, other B vitamins and essential nutrients, such as potassium, copper and amino acids are present. Mango peel and pulp contain other phytonutrients, such as the pigment antioxidants – carotenoids and polyphenols – and omega-3 and -6 polyunsaturated fatty acids (USDA, 2010). The mango triterpene, lupeol, (Chaturvedi et al., 2008) is an effective inhibitor in laboratory models of prostate and skin cancers (Prasad et al., 2008; Nigam et al*.,* 2007 and Saleem et al*.,* 2004, Mango Wilikipedia, 2011). An extract of mango branch bark called Vimang, isolated by Cuban scientists, contains numerous

polyphenols with antioxidant properties in vitro (Rodeiro et al., 2006) and on blood parameters of elderly humans (Pardo-Andreu et al., 2006).

Mango seeds are solitary, large and flat, ovoid, oblong and surrounded by fibrous endocarp at maturity (Litz, 2009). Mango seed could either be mono embryonic or poly embryonic. Mono embryonic seed contains only a single sexual embryo and a single plant grows from a seed of mono embryonic cultivar. In poly embryonic seed, only one embryo is zygotic in origin, it either degenerates or produces a stunted seedling (Singh, 1960). Approximately, 3 to 8 seedlings normally originate from a single poly embryonic seed (Garnar and Chaudhari, 1976), although 30 or more embryos have been recorded in single poly embryonic mango seed (Juliano, 1934 and 1937). Nucellar seedlings can be distinguished from the zygotic seedlings on the bases of their greater vigour at one month after germination (Litz, 2009). Seeds of poly embryonic varieties in general, are heavier than mono embryonic varieties (Sturrock, 1961). Emergence of multiple seedlings from a single seed is referred to as poly embryony and this was observed in many species of Mango. Sachar and Chopra (1957) observed nucellar embryos in 19 mango varieties. There has not been much information on the relationship between seed weight and the number of seedling per seed and morpho-physiological attributes of the local mango studied, therefore, this study was aimed at investigating the relationship between seed weight and seedling attributes of a local Mango variety.

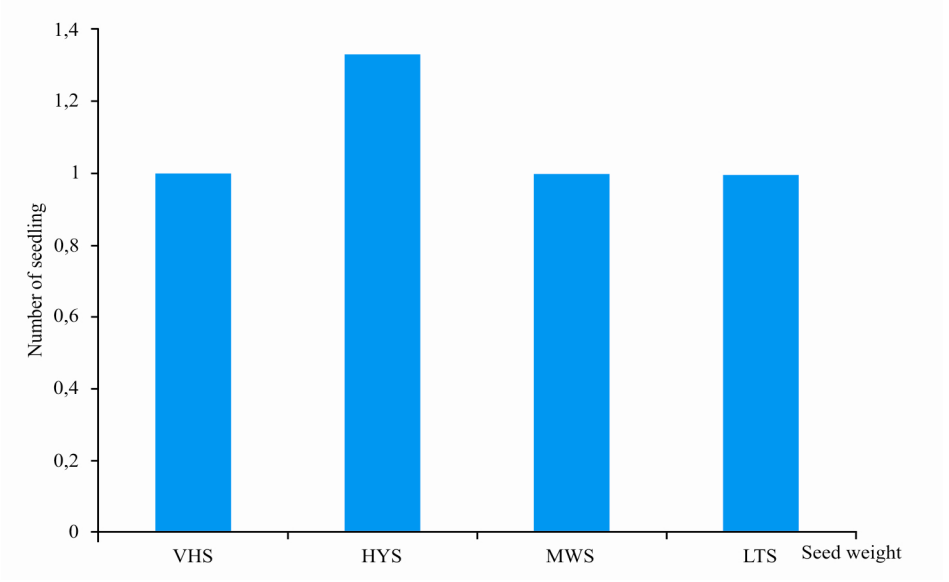
## MATERIALS AND METHODS

Seeds were collected from a local variety of mango (*Mangifera indica*) shortly after the seasonal fruiting period between March and May, 2009 at the University of Ilorin main campus Kwara state, Nigeria. The seeds were weighed and sorted into very heavy (VHS), heavy (HVS), medium (MWS) and light (LTS) (25-32, 20-24, 16-19 and 10-15 g) respectively. The seeds were there after being planted on 01/07/09 in a well drained loamy soil in plastic pots, replicated thrice and arranged randomly in a well lit plant physiology laboratory in the Department of Plant Biology, University of Ilorin, Nigeria. The pots were watered regularly. Number of seedlings per seed, stem height, number of leaves, and seedling dry weight were taken and recorded. The experiment was terminated at about 90 days after planting. Data were subjected to analysis of variance (ANOVA) using SPSS package.

VHS= Very heavy seeds, HYS= Heavy seeds, MWS=medium weight seeds, LTS=Light seeds

RESULTS

The results of this study showed that a group (HYS) among the heavy seeds category produced more than one seedling per seed, while another group (VHS) of heavy seeds produced only one seedling per seed like other groups of seeds (Fig.1).

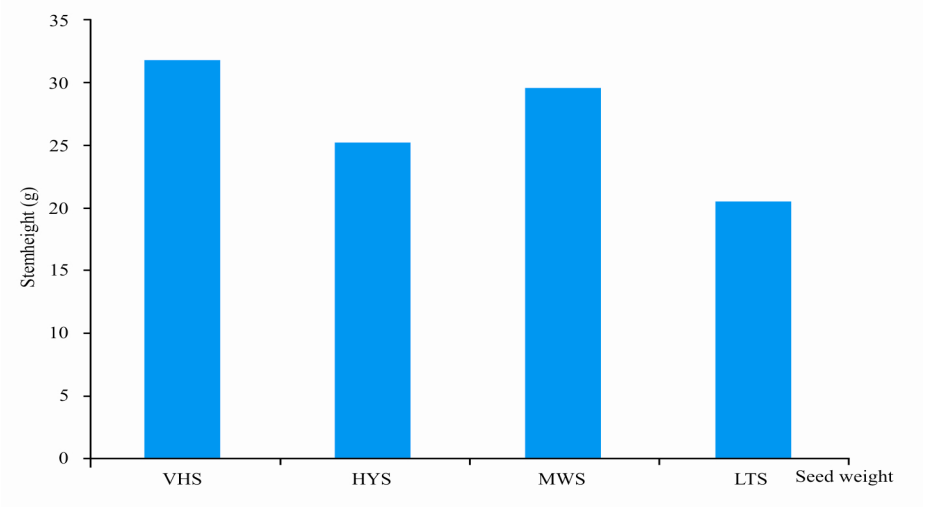



VHS= Very heavy seeds, HYS= Heavy seeds, MWS=medium weight seeds, LTS=Light seeds

**Fig. 1 Effect of seed weight on Mango Number of seedling per seed**

**Graf. 1. Djelovanje težine sjemenke manga na broj klijanaca po sjemenki**

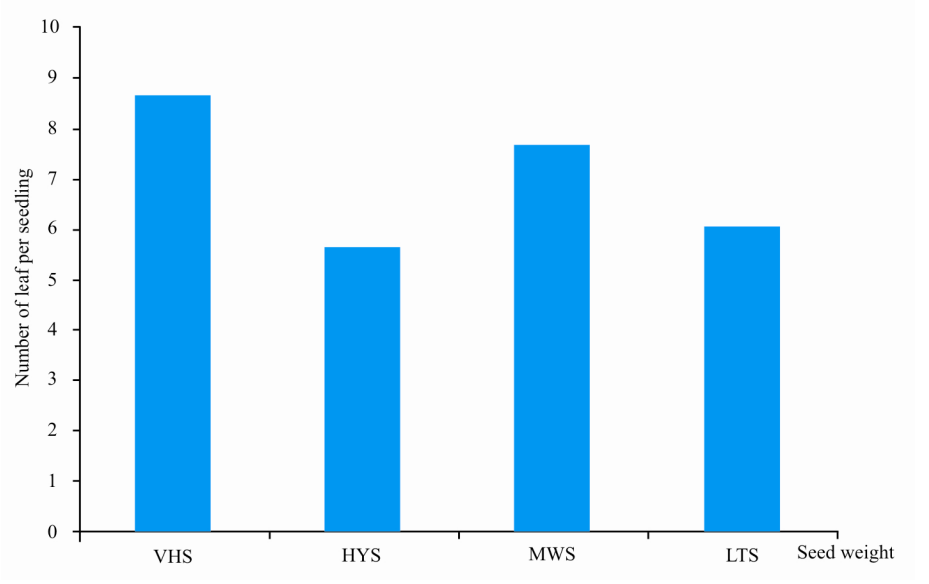
This may be an indication that the seeds of this local mango studied may not be poly embryonic. Greater stem heights were obtained from the seedlings of heavy and medium weights seed groups, while the shortest stem height was obtained in medium and light seeds (Fig. 2). This observation may be due to more nutrient accumulation and availability in bigger and heavy seeds. Number of leaves per seedling was highest in the seedlings from (VHS) seeds followed by medium weight seeds (Fig. 3). However, number of leaves was not significantly affected in this study. Seedling dry weights were much higher in heavy and medium weights seeds than light seeds (Fig. 4). This may be as a result of greater vigour of seedlings after germination which may be due to large amount of food reserves in them.




VHS = Very heavy seeds, HYS= Heavy seeds, MWS=medium weight seeds, LTS=Light seeds

**Fig.2. Effect of seed weight on Mango seedlings Stem height (cm)**

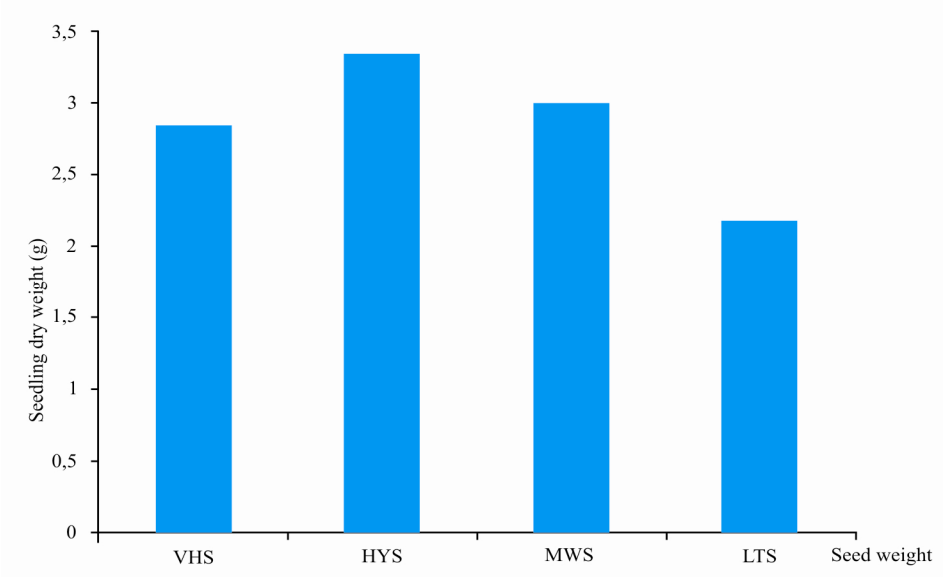
**Graf. 2. Djelovanje težine sjemenke na visinu peteljke klijanaca manga**




VHS= Very heavy seeds, HYS= Heavy seeds, MWS=medium weight seeds, LTS=Light seeds

**Fig. 3. Effect of seed weigt on Mango Seedlings Number of leaf**

**Graf . 3. Djelovanje težine sjemenke na broj listova klijanaca manga**




VHS= Very heavy seeds, HYS= Heavy seeds, MWS=medium weight seeds, LTS=Light seeds

**Fig. 4 Effects of seed weight on Mango Seedling dry weight (g)**

**Graf. 4. Djelovanje težine sjemenke na suhu težinu klijanaca manga**

## DISCUSSION

The results of this study revealed that the effect of seed weight influenced some of the seedlings growth parameters. Seed weight influence was however not statistically significant on the local mango studied. Although heavy seeds produced more number of seedlings per seed, longer stem heights, higher seedling dry weights and more number of leaves, there was no statistical significance over medium and light seeds (Figs.1-4). This however differs from the observation of Olorunmaiye et. al. (2010). who reported statistically significant effects of big and heavy seeds on the seedling dry weights and leaf area of *Daniellia oliveri*. Increase in number of seedlings per seed, seedlings stem height, as well as seedling dry weight was observed in heavy mango seeds. This agreed with the findings of Khan and Shankar (2001), who reported that seedlings of *Quercus semiserrata* from heavy seeds survived better and yielded greater dry mass than those from small seeds. The results obtained from this study also agreed with the reports of other workers who variously reported that large and heavy seeds had better seedling survival and growth than small seeds

(Armstrong and Westoby 1993; Bonfil 1998; Vera 1997). There was a highly positive correlation between stem height and number of leaves as well as between stem height and seedling dry weight (Table 1). There was also a positively high correlation between number of seedlings and seedling dry weight. On the other hand, negative correlations were observed between number of seedlings and stem height as well as between number of seedlings and number of leaves (Table 1.).

**Table 1 Correlation results of the vegetative parameters of Mango (*Mangifera indica*) seedling**

**Tablica 1. Rezultati korelacije negativnih parametara klijanaca manga**

| | Number of seedling | Stem height (cm) | Number of leaf | Seedling dry weight (g) |
|---|---|---|---|---|
| Number of seedling | 1 | -408 | -364 | 0.737 |
| Stem height (cm) | -408 | 1 | 0.747 | 0.16 |
| Number of leaf | -364 | 0.747 | 1 | 0.06 |
| Seedling dry weight (g) | 0.737 | 0.16 | 0.06 | 1 |

## CONCLUSION

The results from this study showed that heavy seeds produced better seedlings vigour, vegetative growth and dry matter accumulation. It was also observed from this study that the seed stock from the local mango studied may not be poly embryonic.

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**Authors' addresses – Adrese autora:**
Olorunmaiye K.S*
Fatoba, P.O
Adeyemi C. OreOluwa
Department of Plant Biology University of Ilorin, Kwara State, Nigeria
* Corresponding author- ksolorunmaiye@yahoo.com

Olorunmaiye P.M
Department of Plant physiology and Crop production,
University of Agriculture, Abeokuta, Ogun State, Nigeria.