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EFFECT OF SEED YIELD AND QUALITY OF OKRA (*ABELMOSCHUS ESCULENTUS* (L.) MOENCH.) ON SEASONS—A REVIEW

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ABSTRACT

The seed yield and quality of okra is highly influenced with seasons, and cultivars. The quality of seed is considered as an important factor for increasing yield. The use of quality helps in higher production per unit area to attain food security. High Seed yield and seed quality is observed when the crop is grown in hot and humid environment (rainy season) than hot environment (summer season). However, the incidence of insect-pests and diseases is very high during rainy season, which significantly affects the quantity and quality of seeds. Summer season grown okra yielded low volume but seed is free from major insect pest and diseases attacked. While rainy season grown okra yielded high volume but seeds affected with major insect pest and diseases. Thus, there is need to study the impact of sowing time on the seed yield and quality.

Key words: *Okra, seed yield, seed quality season etc.*

Okra (*Abelmoschus esculentus* L. Moench, previously *Hibiscus esculentus* L.) is a fruit vegetable crop belonging to the family Malvaceae. Okra is known by many local names in different parts of the world. It is called lady's finger in England, gumbo in the USA, guinogombo in Spanish, guibeiro in Portuguese and okra in India. The cultivated okra has somatic chromosome number 2n = 130. and is considered to be an amphidiploid of *Abelmoschus tuberculatus* (2n = 58) and an unknown species with 2n = 72 (Datta and Naug 1968). Okra is an annual vegetable, grown commercially in India, Turkey, Iran, Western Africa, Yugoslavia, Bangladesh, Afghanistan, Pakistan, Burma, Japan, Malaysia, Brazil, Ghana, Ethiopia, Cyprus and the southern United States. It grows best in hot weather (temperatures 26.8°C) especially in regions with warm nights (.20.8°C) (Incalcaterra and Vetrano 2000). It is an important crop which is widely cultivated in different parts of the world mostly for human consumption and also for industrial use as fibre. It is also good source of iodine which is useful in the treatment of simple goiter and source of other medically useful compound (Moaward1984). The roots and stems of okra are used for cleaning the cane juice from which gur or brown sugar is prepared (Chauhan 1972). Okra provides an important source of vitamins, calcium, potassium (Lamont 1999, Owolarafe and Shotonde 2004) and Okra originated in Asia and Africa (Thomson and Kelly, 1979) is grown in tropical and sub-tropical regions of the world.India is a leading country in okra production (Anonumus 2004) It is often cross pollinated cropand an isolation distance of 200meters between cultivars is recommended for maintaining the purity of seed (Anon,1971). Okra requires a long, warm and humid growing climate for better seed yield. Regardless of the production process, the percentage of seed germination in okra is frequently low, due to tegument impermeability (hard seeds). This is the major barrier to the emergence of commercial producers of okra seeds (Castro, 2005) The unavailability of quality seed is the most important reason for low yield. Sowing time has a great impact on seed production and quality of okra (Singh *et al.,* 1986; Hossain *et al.,* 1999; Yadav and Dhankhar, 2001).

Seed can only geminate in relatively warm soils, no germination occurs below 17°C and optimum temperature for seed germination is 29°C. When day temperature exceeds 42°C, flower drop (Chauhan,1972). Suitable environment for seed production of okra need low precipitation, low relative humidity and high light intensity with hot and dry conditions during seed ripening. Temperature, humidity and radiation are major meteorological parameters, which influence all aspects and stages of crop growth of seed production. Early sowing (March – June) could be recommended for fresh pod production since seeds produced during July- August would be affected by rain and fungal diseases. (Samnotra *et al.,* 2002).

Effect of seed yield on seasons : High yielding ability is linked to a range of plant characteristics including

plant architecture, nutrient use efficiency and other factors like adaptation to local conditions, pest and disease tolerance etc. Higher yields mean more food and income for farmers. (Abdalla.1969) concluded that environmental factors have great influence on growth and seed yield of crops .High yield and quality of vegetables depends on high seeds quality of improved cultivars, in addition to the optimum cultural practices. Sowing date as a major factor affecting both plant growth and seed yield and quality. Optimum temperature, low relative humidity and low rain fall during seed maturity resulted in higher yields of quality seed of cotton and some vegetables (Delouche, 1980) whereas, high temperature and humidity increased seed susceptibility to fungal diseases. Time to flowering and duration of growth strongly influences the climatic adaptation and yield potential of a crop. Okra requires warm to hot weather conditions (23°C-37° C) for optimum growth and yield... Both quantitative and qualitative traits of of crop depend on sowing time (Farrag, 1995) In India Yadav and Dhankhar,2001) reported higher okra plants with good vegetative growth in June sowings compared to August sowings. The seed diameter is found to increase as the fruit advanced towards maturity. The reduction in fruit moisture content with advancement of maturity might be due to the development of seeds and fibre in the fruit (Singh *et al*. (1990) and Samnotra *et al*. (2002). The slight reduction in seed diameter may be attributed to the loss of moisture from the seeds with maturity (Sajjan and Jamadar (2003).

Seed Quality Parameters

Standard Germination test (%) : Germination test has conducted as per the International Seed Testing Association (ISTA)3 procedure by adopting between paper method in a germinator maintained at 25-30°C and 95±3 per cent relative humidity in three replications each of 100seeds. The first count on fourth day and second count on tenth day of germination for normal seedling was made and expressed as germination percentage.

$$\text{Seed germination (\%)} = \frac{\text{Number of seed germinate}}{\text{Number of seed tested}} \quad 100$$

Seedling length (cm) : Five normal seedlings from the germination test has randomly selected for measurement of seedling length on tenth day. The seedling length has measured from the collar region to the tip of the primary leaf. The mean seedling length was expressed in centimeters.

Seedling vigor index (VI) : The seed vigour index was calculated as per the Abdul-Baki and Anderson (1973) by the following formula:

Seed vigour index = Germination percentage × Total seedling length

Effect of seed quality on season : Seeds sown in either 15 February or 15 March produced the best quality seed (88.7% and 83.7% germination, 29.75 and 28.80 vigour index, respectively), whereas 15 April and 15 May sowings produced inferior seed (70% and 72.9% germination 18.75 and 23.75 vigour index, respectively). The highest germination percentage and seed vigour index was obtained from 15 February and 15 March sowing because the fruits faced lower amount of rainfall during their harvesting period compared to others. Huda and Samirudding (1987) who recommended that mid February to mid March are the best time for quality seed production of okra under Bangladesh condition. Chattapadhya and Sahana (2000) noticed that most of the seed quality and yield parameter improved significantly with increasing rates of N and P. The optimum N and P rates, being 100 and 60 kg/ha. respectively. Prabhakar *et al.,* (1985) noticed best seed quality and yields were produced by pods on the 3rd and 4th node. Kanwar and Saimbhi(1987) reported that although the number of seeds/pod reached a maximum 28 days after anthesis, the number of mature seeds, seed weight/pod and germination percentage were highest in seeds from pods harvested 35 days after anthesis. Pod position in the plant affects seed quality. Pereira (1975) verified that seeds from pods located in the middle of the plant presented higher germination capacity than those extracted from pods located in plant ends and ramifications. Looking for information about pod maturation, Setubal *et al*. (1994) concluded that, regarding seed production, the most adequate stage for pod harvesting is between 45 and 55 days after anthesis (DAA) for cultivars Campinas-2, Santa Cruz 47 and Amarelinho. In the case of cultivar Santa Cruz 47, Castro (2005) observed that seed quality decreased in pods harvested between 34 and 41 DAA without a post harvest resting period

Germination percentage and seedling vigour are important parameters for determining the physiological maturity of seeds (Singh and Sindhu, 1985). Maximum germination percentage is found in seeds from pods picked at 40 days after flowering. It is observed that seeds from early picking (up to 12 days after flowering) completely failed to germinate and after this stage the germination started to occur. Devadas *et al*. (1998) reported that the developing seeds attained germinable maturity at 21 days after

anthesis and highest germination is recorded at 30 to 36 days after anthesis (Berchie *et al*. (2004). The poor germination of early picked seeds could have been due to the large proportion of immature seeds in these sets of seeds, while seeds become viable and vigorous due to proper and proportionate development of embryo and endosperm by about 26 days after flowering (75% or more germination occurred).

Combined effects of sowing time and plant spacing : Rastogi *et al.* (1987 found that the closest spacing (60 × 30 cm) forced to grow taller plant and increase seed yield per hectare but reduced number of mature fruits per plant, length and diameter of mature fruit, number of seeds per fruit, 1000-seed weight, and seed yield per plant. Singh *et al.* (1986) reported that keeping with Plant spacing of 60 × 40 cm produced the highest seed yield of okra (2.86 t/ha) followed by 60 × 30 cm spacing (2.80 t/ha). Maximum number of mature fruits per plant (26.70) was recorded from the widest spacing (60 × 60 cm) having maximum length (17.67 cm) and diameter (1.98 cm) of fruit. This might be due to competition for nutrient and space among the plants owing to maximum plant population. This result is in close conformity of Zanin and Kimoto (1988).The germination percentage is an indicator of the ability of the seed to emerge from the soil to produce a plant in the field under normal conditions. Seed vigour is the capacity of seed to emerge from the soil and survive under potentially stressful field conditions and to grow rapidly under favourable conditions. The germination percentage was estimated seeds using the formula prescribed by(ISTA (1999):

Effect of YVMV on season : YVMV is transmitted by white fly (*Bemisia tabaci* Gen.) is the most serious disease of okra. Yellow vein mosaic virus (YVMV) causes significant losses in the okra production. YVMV disease of okra was first reported in 1924 (Kulkarni 1924). Infection of 100% plants in a field is very usual and yield losses ranges from 50% to 94% depending on the stage of crop growth at which infection occurs (Sastry and Singh 1974). Different degrees of chlorosis and yellowing of veins and veinlets, smaller leaves, fewer and smaller fruits, and stunting are the characteristic of YVMV. Fruit yield is greatly reduced, by as much as 96% if the crop is infected with YVMV at early stage (Pun & Doraiswamy 1999)and this consequence reduced seed yield and seedquality.The disease intensity of the experimental plots is measured following 0-4 scale and the percent disease index (PDI) of yellow vein mosaic virus at different days after sowing (DAS) The population dynamics of whitefly was also monitored throughout the growing seasons. The economic analysis of seed production of okra is worked out on the basis of prevailing prices of inputs and seed yield.significance. (Gomez and Gomez, 1984). Correlations between variables were tested for significance.

$$\text{PDI (\%)} = \frac{\text{Disease intensity of observed plot}}{\text{Maximum scale} \quad \text{No. of plant observed}} \quad 100$$

CONCLUSIONS

Summer season is the good season over rainy season for seed yield and despite seed yield is low in summer season but plant does not get heavy infestation with insect pest and YVMV. Rainy season gives higher seed yield but get heavy infestation with insect pest and YVMV. Summer season is facilitated seed drying properly over rainy season.

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