The Andhra Agric. J 69 (1): 36-40, 2022

Impact of Potassium and ABA Application on Vivipary and Seed Quality in Oriental Pickling Melon (*Cucumis melo* var. *conomon* Mak.).

K Vaisakh, Dijee Bastian, Rose Mary Francies, C Beena, Syama S Menon and S Ruth Oliviya
Department of Seed Science and Technology, College of Agriculture, Vellanikkara

ABSTRACT

An experiment was conducted in oriental pickling melon to evaluate the impact of potassium and ABA in controlling vivipary. The crop raised during the month of February (2021) was given foliar treatments of abscisic acid (100 mg/l, 200 mg/l and 300 mg/l), potassium (MOP: 0.5%, 1% and 1.5%) and basal application of fertilizers with 50% additional K. the foliar application of ABA (300 mg/l) was the most effective followed by 1.5% MOP in controlling vivipary. The best treatment for the overall improvement of seed and fruit yield parameters was foliar spray with 300 mg/l ABA.

Keywords: *Vivipary, Seed quality, Abscisic acid (ABA), Potassium and Oriental pickling melon.*

The quality of seed is influenced by genetic and external factors. One of the factors that deteriorates the quality is vivipary. It is also known as premature or precocious germination, where the seeds sprout within the fruit before they are detached from the mother plant. This trait is detrimental as it causes yield and viability losses and leads to inferior nutritional and palatable qualities of fruits and unviable seeds. The high humidity and temperatures during seed development have been accounted as the reason for vivipary (Andreoli *et al*., 2006). Vivipary is due to complex innate and ecological elements and the impact of a few genes (Zhang *et al*., 2017).

Oriental pickling melon or golden melon is one of the crops where vivipary has been reported and studied. It is a summer vegetable that belongs to the family Cucurbitaceae used for culinary purposes. They are cultivated mainly in East Asia and Japan. The primary oriental pickled melon growing states in India include Kerala, Tamil Nadu, Andhra Pradesh, and Karnataka. In Kerala it is called Sambar Vellari, Vellari or Kani Vellari and it occupies a predominant place in the summer rice fallows. Other than culinarypurposes, the fruits are kept as a symbol of prosperity during the festival of 'Vishu' increasing its economic and cultural importance in the state. The smooth and cylindrical fruits have white flesh with watery texture similar to that of a cucumber, yet it retains its shape when cooked.

Different fertilizer management practices were found to be useful in reducing the precautious germination in melon fruits. According to Ochi and Ito (2012), vivipary in melon seeds can be reduced by supplementing the plant with high doses of potassium. Exogenous utilization of ABA additionally answered to restrain the event of vivipary and brought about stamped increment of potassium retention (Ochi *et al*., 2013). According to a study conducted in oriental pickling melon variety Saubhagya, occurrence of vivipary was observed to be highest during December sowing (6.25%) and January (3.60 %) sowing (Nagendra *et al*., 2017). Further studies by

Athulya (2019) revealed that application of extra dose of 25% MOP, 50% MOP and 0.5% foliar spray of potassium reduced the incidence of viviparous seeds in oriental pickling melon. Hence, the present study was aimed at determining the impact of potassium and abscisic acid in vivipary and seed quality in oriental pickling melon.

MATERIAL AND METHODS

The field study was conducted at the Department of Seed Science and Technology, College of Agriculture, Kerala Agricultural University, Vellanikkara during February 2020. The field is situated at an altitude of 40 m above MSL at 10°54' N latitude and 76°28' E longitudes. The area experiences a warm and humid tropical climate.

The seeds of oriental pickling melon variety Saubhagya that were pre-soaked for 24 hours were sown at the field in 24 plots with eight treatments and three replications following randomised complete block design (RCBD). The crop was sown at a spacing of 1m x 0.3m by following high density planting. The crop was raised as per recommendations in the package of practices of Kerala Agricultural University (2016). The crops were given a basal fertiliser dose of NPK at 70:25:25 kg/ha with 50% extra dose of potassium (34.75 kg/ha) in one of the treatments. All other treatments were foliar spray of abscisic acid (100 mg/l, 200 mg/l and 300 mg/l) and potassium (MOP: 0.5%, 1% and 1.5%). The foliar treatments were given at 50% flowering and the potassium spray was repeated after two weeks.

The fruits were harvested from ten randomly tagged plants of each replication at its physiological maturity and the fruit yield attributes were recorded. After recording observations, the fruits were cut open and the seeds were extracted manually for the evaluation of seed quality and yield parameters.

Table 1. Effect of potassium and ABA on seed quality and yield parameters in oriental pickling melon

Treatments	Seeds per fruit	Seed yield per plant (g)	Vivipary (%)
T1 (0.5% MOP)	480.00^{c}	30.25^{b}	6.49^{b}
T2 (1% MOP)	485.00^{c}	19.72^{c}	5.36^{bc}
T3 (1.5% MOP)	497.00^{bc}	26.74^{b}	3.29^{d}
T4 (100 mg/l ABA)	586.33^{ab}	31.47^{b}	6.23^{b}
T5 (200 mg/l ABA)	553.00^{abc}	29.44^{b}	3.93^{cd}
T6 (300 mg/l ABA)	625.33^{a}	43.21^{a}	1.37^{e}
T7 (70:25:25 kg/ha + 50%K)	453.33^{c}	30.31^{b}	8.24^{a}
T8 (70:25:25 kg/ha)	480.00^{c}	16.19^{c}	9.73^{a}
CD (0.05)	94.068	5.875	1.792
SE	43.438	1.918	0.564

Table 2. Effect of potassium and ABA on fruit quality and yield parameters in oriental pickling melon

Treatments	Fruit yield per vine (kg)	Fruit length (cm)	K content in fruit placenta (%)	K content in fruit flesh (%)
T1 (0.5% MOP)	2.63^{ab}	16.83^{c}	0.115^{c}	0.062^{c}
T2 (1% MOP)	2.53^{abc}	20.00^{ab}	0.132^{b}	0.063^{c}
T3 (1.5% MOP)	1.95^{bc}	17.67^{bc}	0.139^{b}	0.083^{b}
T4 (100 mg/l ABA)	2.82^{a}	20.67^{a}	0.107^{cd}	0.076^{b}
T5 (200 mg/l ABA)	2.89^{a}	20.83^{a}	0.117^{c}	0.080^{b}
T6 (300 mg/l ABA)	3.23^{a}	20.46^{a}	0.153^{a}	0.102^{a}
T7 (70:25:25 kg/ha + 50%K)	3.01^{a}	19.80^{ab}	0.101^{d}	0.064^{c}
T8 (70:25:25 kg/ha)	1.86^{c}	18.90^{abc}	0.099^{d}	0.059^{c}
CD (0.05)	0.689	2.265	0.011	0.011
SE	0.227	0.74	0.004	0.004

RESULTS AND DISCUSSION

The treatments had significant influence on characters like vivipary, seeds per fruit and seed yield per plant (Table 1). Vivipary was found to be lowest in treatment with 300 mg/l ABA with a value of only 1.37 per cent which was followed by treatment 1.5 per cent MOP showing a vivipary of 3.29 per cent. According to Welbaum *et al.* (1990) low ABA content in the fruit tissues can lead to vivipary in muskmelon. Abscisic acid prevents vivipary by inducing dormancy in the seeds. The increase in ABA content in fruits by direct application of ABA had a positive impact in the reduction of precocious germination. The increase in ABA content in fruits and seeds was observed in tomato treated with exogenous ABA (Zhang *et al.*, 2009). The effect of ABA application in reducing the viviparous sprouting as observed in the present study is in agreement with the results reported by Ochi *et al.* (2013).

The application of potassium fertilizer was also found to be effective in reducing vivipary in melon seeds (Ochi and Ito, 2012). This may be due to the fact that the higher rate of potassium caused an increase in the ABA content in the fruit juice present around the placenta (Ochi *et al.*, 2013). Similar results on effect of potassium on reducing vivipary was also reported by Athulya (2019) in oriental pickling melon.

The number of seeds per fruit and seed yield was higher in treatment with 300 mg/l ABA. This may be caused due to the role of abscisic acid in enhancing the accumulation of nutrients in the seeds. A higher seed yield was also noted in chickpea by the application of ABA (Kumar *et al.*, 2008) to plants. In general, foliar treatments of bioregulators like ABA have been found to be quite successful in increasing grain output, especially under high temperature conditions (Kumar *et al.*, 2020).

The result on effect of potassium and ABA on fruit quality and yield parameters shows that the treatments had significant impact on fruit length, yield and the potassium content in fruit flesh and placenta (Table 2). The treatment, 200 mg/l ABA recorded the highest fruit length of 20.83 cm which was on par with 100 mg/l ABA (20.67 cm) and 300 mg/l ABA (20.46 cm). All the ABA treatments were effective in increasing the fruit length. This may be caused by an

increase in the level of nutrient and water absorption due to enhanced root hair formation induced by ABA (Bai *et al*., 2007). The enhanced allocation of nutrients to the fruits may have led to increased growth and development in the melon fruits. Higher yield was noticed in treatments, 300 mg/l ABA (3.23 kg), 100 mg/l ABA (2.82 kg), 200 mg/l ABA (2.89 kg) and 70:25:25 kg/ha (NPK) + 50% additional K (3.01 kg). Quiroga *et al.,* (2009) reported similar results where, ABA spraying can boost yield per plant in field-grown grapes by promoting berry set due to ABA-promoted allocation of photo assimilates.

The effect of potassium in the improvement of yield may be related to improved photosynthetic activities and transfer of photosynthates from production sites to sink (Patil, 2011). The increase of yield in oriental pickling melon by the application of potassium fertilizer was also reported by Athulya (2019). Similar results were reported by Singh and Sahare (2019) in muskmelon.

The highest level of potassium content in the flesh of fruit was seen in treatment with 300 mg/l ABA (0.10 per cent) followed by 1.5 per cent MOP (0.08 per cent), 200 mg/l ABA (0.08 per cent) and 100 mg/l ABA (0.08 per cent). Similarly, the highest content of potassium in fruit placenta was observed in 300 mg/l ABA (0.15 per cent) followed by 1.5 per cent MOP (0.14 per cent) and 1 per cent MOP (0.13 per cent).

CONCLUSION

From the results of the present study, it may be safely concluded that foliar spray of potassium (1.5 % MOP) or ABA (300mg/l) can help improve seed yield and quality by reducing the incidence of vivipary. From the farmer's point of view, it may be best to use the foliar spray of potassium as it is much cheaper and easily available compared to ABA for quality seed production unless a cheaper grade of ABA is commercially available for use in agriculture.

LITERATURE CITED

Andreoli C, Bassoi M C and Brunetta D 2006 Genetic control of seed dormancy and preharvest sprouting in wheat. *Scientia Agricola,* 63: 564-566.

Athulya S 2019 Potassium nutrition on vivipary and seed quality in oriental pickling melon (*Cucumis melo* var *conomon* Mak) *M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur,* 201p.

Bai L, Zhou Y, Zhang X, Song C and Cao M 2007 Hydrogen peroxide modulates abscisic acid signaling in root growth and development in Arabidopsis. *Chinese Science Bulletin,* 52(8): 1142-1145.

Kerala Agricultural University 2016 Package of Practices Recommendations : Crops 15 th edition. Kerala Agricultural University, Thrissur – 392p.

Kumar P, Yadav S and Singh M P 2020 Bioregulators application improved heat tolerance and yield in chickpea (*Cicer arietinum* L) by modulating zeaxanthin cycle. *Plant Physiology*, 25(4): 677-688.

Kumar S, Kaur G and Nayyar H 2008 Exogenous application of abscisic acid improves cold tolerance in chickpea (*Cicer arietinum* L). *Journal of Agronomy and Crop Science,* 194(6): 449-456.

Nagendra M S, Bastian D, Francies R M and Rajendra AA 2017 Optimizing planting time seed extraction and seed storage in oriental pickling melon (*Cucumis melo* var conomon Mak). *International Journal of Chemical Studies*, 5(4): 1910-1912.

Ochi Y and Ito T 2012 Viviparous sprouting of melon seed and endogenous abscisic acid (ABA) as affected by potassium fertilization. *Horticulture Research,* 11(1): 43-48.

Ochi Y, Ito T, Hohjo M, Tsukagoshi S, Johkan M, Maruo T and Shinohara Y 2013 Inhibition of Viviparous Sprouting on Melon Seeds Using High Level of Potassium Fertilization or Abscisic Acid Application. *Journal of Japanese Society for Horticulture Science*, 82(3): 227-233.

Patil R B 2011 Role of potassium humate on growth and yield of soybean and black gram. *International Journal Pharma and Bio Sciences,* 2(1): 242-246.

Quiroga A M, Berli F J, Moreno D, Cavagnaro J B and Bottini R 2009 Abscisic acid sprays significantly increase yield per plant in vineyard-grown wine grape (*Vitis vinifera* L) cv Cabernet Sauvignon through increased berry set with no negative effects on anthocyanin content and total polyphenol index of both juice and wine. *Journal of Plant Growth Regulation,* 28(1): 28-35.

Singh G and Sahare H A 2019 Response of Different Potassium Fertilizers as Foliar Application on Yield and Quality of Muskmelon (*Cucumis melo* L) Fruit. *Annals of Biology,* 35(2): 268-272.

Welbaum G E, Tissaoui T and Bradford K J 1990 Water relations of seed development and germination in muskmelon (*Cucumis melo* L) III Sensitivity of germination to water potential and abscisic acid during development. *Plant Physiology,* 92: 1029-1037.

Zhang G, Johkan M, Hohjo M, Tsukagoshi S and Maruo T 2017 Plant growth and photosynthesis response to low potassium conditions in three lettuce (*Lactuca sativa*) types. *The Horticulture Journal* 86(2): 229-230.

Zhang M, Yuan B and Leng P 2009 The role of ABA in triggering ethylene biosynthesis and ripening of tomato fruit. *Journal of Experimental Botany* 60(6): 1579-1588.

Received on 29.03.2022 and Accepted on 30.04.2022