**EffectofPGR and chemicalsonshelf life,bunchand berryqualityparameters ofSudhakar seedlessgrapes.(*VitisVinifera*L.)**

**Abstract:**

The experiment was conducted on Sudhakar Seedless vines grafted on110-R rootstockwere selected for this study. The experiment was designed in randomized block design (RBD) having fivetreatments with four replications were carried out at MRDBS Nashik during2020-2021.Pre-harvest application of treatments(Chitosan at 10 ppm,Naphthalene acetic acid at100 ppm,activated Potassium salt @ 2.0 g/ liter, Salicylic acid at 2.0 ml/literand Potassium Schoenite @ 2.0 g/liter along with untreated vines were applied at veraison stage of berry development. Application of Chitosan @ 10 ppm resulted in to the increase berry size and berry quality along with less Number of rotten berries in physiological loss in weight. Followed by the application of Naphthalene acetic acidat 100 ppm recorded less Number of rotten in this study. However, the lowestphysiological loss of weight (%) were recorded with the application of Naphthalene acetic acid. The increasing dose of Naphthalene acetic acid resulted into decrease in pre- harvest berry drop.In grapevines, Application of salicylic acid significantly increase in berry weight, bunch weight, Total SolubleSolids /acidity ratio ascompare to untreated vines. Biochemical composition of berries was influenced by theapplicationofActivated potassium saltatdifferentconcentration. Theapplication of Potassium schoenitein grapevines were found effective for increasing TSSofSudhakar seedlessgrapes.

**Key words:**Chitosan,Naphthalene acetic acid, Shelf life, Potassium schonite, Yield and Grapevines.

## INTRODUCTION

"Grape (*Vitisvinifera*L.) is the most important commercial crop grown in India,especially in Maharashtra. Sudhakar seedless. For this variety the veraison(change of color of the grape berries) after 90 days from pruning and require 25 to 30 days for harvest. The fruitwill be ready to harvest between 120 to 125 days after pruning being early maturing variety.But the ripe berries are sensitive to hot climates and ,keeping qualities (shelf life). To regulatethe market supply and to reduce the losses, pre and post-harvest applications with plantgrowth regulators, chemicals and wrappers have been useful, in extending the shelf life ofgrapesduringstorage, enablingto reducepost-harvest losses".(Shanta Krishnamurthy,1985)."Plant hormones (also known as phytohormones) are naturally occurring organic substances that influence growth and development in very low concentrations and whose action may be involved in places remote from their origin. Hormones determine the formation of flowers, stems, leaves, the shedding of leaves and the development and ripening of fruit. Plants, unlike animals, lack glands that produce and secrete hormones; instead each cell is capable of producing hormones. The influences on fruit production by the growth regulators are numerous and are employed in a wide range of circumstances varying from tissue culturally propagated plants to enhancing post-harvest storage life through almost all stages of plant life in between. It is not always the effect of single growth regulator but the interaction effect of different hormones in combination for instance; the ratio of cytokinin to auxin determines the fate of callus if it is high it promotes shoot proliferation while as low cytokinin: auxin ratio enhances root formation" (Jain, 2013). "Application of growth regulators is also reported to increase the yield and quality of grape. Among the plant hormones applied in grapes, GA being growth promoting hormone commands a special place and is being used for different purposes such as to loosen the bunch, increase the berry size and improve the growth, yield and quality of fruits" (Jindal,

1985). The present study was, therefore, undertaken to investigate the effect of growth regulators/ enhancer on the yield and quality characteristics of grape under tropical conditions of India.

## MATERIALSANDMETHODS

### ExperimentalSite:

The experiment was conducted at research and developmental vineyards at MRDBS Nashik during2020-2021. Seven year-old Sudhakar seedless grafted on Dog ridge rootstock were selectedfor the study. The vines were planted at a spacing of 2.5 m between rows and 1.2 m betweenvines within a row. The row orientation was in the direction of North – South. The vines weretrainedtodoublecordon Ysystem.Thesoilofthisregionisblackhaving pH 7.75 and EC 0.46 dS/ m.However,waterusedforirrigationhadEC1.8andpH8.3.The experiment was designed as Randomized Block Dsign (RBD) having five treatments and4 replications for each treatments (2.5 m x 1.2 m). Application of following chemicals done at veraison stage of berry development.

**Table 1TreatmentDetails**

| Treatment details | Dose ml/ha or ppm |
|---|---|
| Chitosan@ 10 ppm | 10.00 ppm |
| Naphthalene Acetic acid @ 100 ppm | 100.00 ppm |
| Activated Potassium salt @ 2.0 g/ liter | 2500 g/ha |
| Salicylic acid @ 2.0 ml/liter | 2000 l/ha |
| Potassium Schoenite@ 2.0 g/liter | 1000 g/ha |

**YieldandYieldComponents**

Yield and berry quality of Sudhakar seedless grapes were recorded at harvest. At harvestingstage parameters such as average bunch weight (g) was calculated from average weight of 15bunches while yield per vine (kg) was recorded at the time of harvest. Randomly selectedberries from bunches were used for berry weight. To measure average berry length and berrydiameter, 10 berries were selected randomly from different bunches from a given replicationand measured using Digital VernierCaliper (0–300 mm RSK™) and were expressed inmillimeter.

**BiochemicalAnalysis:**

Total soluble solids (TSS) were measured using hand refract meter and expressed as degreeBrix. Acidity was measured by titrating the sample with 0.1 N sodium hydroxide usingphenolphthalein indicator (A.O.A.C, 1985).The total phenol and Tannins content of the berryweredeterminedusingtheFolin-Ciocalteumethod(SingletonandRossi,1965)usingCatechol, as the standard. Total flavonoid content (TFC) was determined using the aluminumchlorideassaydescribedbySamathaet al. (2012).

**Physiologicallossinweight(PLW):**

ThePLWwascalculatedoninitialweightbasis.Thephysiologicallossinweightofbunch was recorded on the basis of initial fresh weight of the fruit and subsequent loss inweightoccurred duringpostharvest storageandexpressed as percentage.

$$PLW(\%) = \frac{\text{Initialweightoffruit} - \text{Finialweightoffruit}}{\text{Initialweightoffruit}} \times 100$$

**Fallen andRotten Berries (%):**

Fallenandrottenberry were calculated by using following formulas.

$$\text{Fallenberry(\%)} = \frac{\text{Weightoffreeberriesinsideeachbox}}{\text{Totalbunchweight}} \times 100$$

$$\text{Rottenberries(\%)} = \frac{\text{Totalweightofbunch-Bunchweightafterremovingdefectedberries}}{\text{Totalweightofbunch}} \times 100$$

**StatisticalAnalysis:**

TheexperimentwasconductedinRandomizedBlockDesignconsistingoffivetreatments with four replications. All calculations were performed using the GLM procedureofSAS System software,(version 9.3.)

## Resultanddiscussion

**Yieldandqualityparameters:**

Applying the chemicals at different concentrationdemonstrated a beneficial effect onbunch weight, yield and berry weight in Sudhakar seedless grapes (Table 2). Bunch treated withChitosan @10 ppm had significantly higher bunch weight (392.56g). Application of Naphthalene acetic Acid at preveraison stage increasesthe yield per vine. Result obtained from this study clearly showed that the yieldsignificantlyincreasedby theapplicationofNaphthalene acetic Acidat100ppm(14.60kg)followed by the treatment Salicylic acid (13.53 kg).The results confirm thefinding ofManishPrajapatiandDeviSingh,(2018)whileworking onGuava(*Psidiumguajava*L.) they reported that combination of different plant growth regulators significantlyaffectedtheparameterssuchasplantheight,fresh fruitweight(g),yield/plant (kg)foundtobe

Under the treatment (NAPHTHALENEACETIC ACID 200ppm). There were no significantly differences were recordedforberrylength,berrydiameterand pedicel diameter.

The data recorded on TSS, Acidity was significantly influenced by potassium schonite the treatments.

ThehighestT.S.S.(21.02$^0$Brix)withleastAcidity(0.47%)wasobtainedwithapplicationpotassium schonite.While, leastTSS. This investigation might be due to the higher concentration of Naphthalene acetic Acid at 100 ppm. The study confirms the finding of Teaotia*et al*. (1972) found that pre-harvestspraying of Naphthalene acetic Acid at different concentration viz. 100 ppm increased the TSScontent of guava fruits. Also, Mahmud *et al. (*2008) opinioned that "the decrease in titratableacidity in papaya during storage probably due to decrease in citric acid and calcium causinginhibition of enzymatic activityleading to delay in the use of organic acid in the enzymaticreaction of respiration. The mean TSS and acid ratio increased withincrease in storageperiod. The maximum TSS and acid ratio was observed in potassium schonite followed by theSalicylic acid 2ml/ lit".

**Table2.EffectofPGR and other chemicalsonbunchand berryqualityparameters ofSudhakar seedlessgrapes.**

| Treatment | Bunch Weight (g) | Berry Weight (g) | Berry diameter (mm) | Berry length (mm) | Pedicel diameter (mm) | Skin Thickness (mm) | TSS (°Brix) | Acidity (%) | Yield/ vine kg /Vine |
|---|---|---|---|---|---|---|---|---|---|
| **T1** | 392.56 | 3.50 | 17.10 | 18.09 | 1.11 | 18.67 | 19.56 | 0.56 | 13.01 |
| **T2** | 320.14 | 4.12 | 18.05 | 19.43 | 1.28 | 29.00 | 18.21 | 0.66 | 14.60 |
| **T3** | 300.95 | 3.09 | 16.12 | 17.16 | 1.04 | 17.00 | 19.60 | 0.60 | 12.86 |
| **T4** | 377.68 | 3.96 | 17.73 | 18.86 | 1.21 | 20.67 | 18.60 | 0.66 | 13.53 |
| **T5** | 352.05 | 3.67 | 16.82 | 17.75 | 1.16 | 19.33 | 21.02 | 0.47 | 13.49 |
| **SEm (±)** | 5.04 | 0.03 | 0.23 | 0.35 | 0.03 | 2.16 | 0.24 | 0.03 | 0.23 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **C.D @ 0.5 %** | 16.70 | 0.09 | 0.78 | 1.16 | 0.09 | 7.14 | 0.81 | 0.09 | 0.76 |

**Biochemicalparameters:**

The data recorded on biochemical changes of Sudhakar seedless vines were presented inTable 3.The result obtained from the study revealed that the application of PGR at differentconcentration does not affect the phenolic properties of berry. This result might be just due tothe time of application of NAPHTHALENEACETIC ACID and its chemical properties. NAPHTHALENEACETIC ACID is applied to increase theshelf life of grapes at pre veraison stage. The result in hand confirm the finding of Artes-Hernandez et al., (2006)reported that "white Superior Seedless table grapes stored for 7 daysat 0 $^0$C, followed by 4 days at 8 $^0$C under modified atmosphere packaging, did not changetheir total phenolic content. Further slight decreases were seen during their subsequent shelf-life".

**Table3:EffectofPGR and other chemicalsonbiochemicalparametersofSudhakar seedlessgrapes**

| **Treatment** | **Phenol** | **Tannin** | **Flavonoids** |
|---|---|---|---|
| | **(mg/g)fresh.wt.** | **(mg/g)fresh.wt.** | **(mg/g)fresh.wt.** |
| **$T_1$** | 1.72 | 2.08 | 54.77 |
| **$T_2$** | 3.66 | 3.78 | 80.54 |
| **$T_3$** | 1.61 | 1.87 | 49.57 |
| **$T_4$** | 1.21 | 1.54 | 50.91 |
| **$T_5$Control** | 2.93 | 3.04 | 62.05 |
| **SEm(±)** | 0.17 | 0.26 | 1.66 |
| **C.D@0.5%** | 0.56 | 0.88 | 5.52 |

**Physiologicallossinweight(PLW):**

The data on physiological loss in weight (PLW) of grape bunches as influenced by thepre-harvest treatment with growth regulators are presented in Table 4. Among the treatmentshighest PLW was observed in control at (10.58 per cent). PLW was less in NAPHTHALENEACETIC ACID @ 100 ppmat (7.23 percent). Data revealed that reduced PLW %, fallen berries %, rotten berries % wereobserved with application ofChitosan. Findings confirm with the report of Ranjeet and Gupta (1987) that pre harvestspray of NAPHTHALENEACETIC ACID @ 100 reduced the physiological loss in weight in perlette grapes. The resultsobtained in this investigation might be due to the application of NAPHTHALENEACETIC ACID at pre harvest reduceswater loss in berries after post-harvest storage. These studies confirm the findings of Dass etal. (1972) and Beerh et al. (1976) reported that the use of growth regulators as pre-harvestsprays improves the quality of grapes and also the shelf life. In CheemaSahebi, a pre-harvestsprayof NAPHTHALENEACETIC ACID@50 and@100 ppm significantlyreduced thepost-harvest berryshattering.

**Table 4.EffectofPGR and other chemicalsonShelflife ofSudhakar seedless Grapesat7$^{th}$Dayafterstorage**

| Treatment | PLW | FallenBerry | RottenBerry |
|---|---|---|---|
| | (%) | (%) | (%) |
| $T_1$ | 9.42 | 2.25 | 2.15 |
| $T_2$ | 7.21 | 2.89 | 3.15 |
| $T_3$ | 8.10 | 2.10 | 3.84 |
| $T_4$ | 7.56 | 1.52 | 8.50 |
| $T_5$Control | 10.58 | 4.75 | 10.13 |
| SEm(±) | 0.59 | 0.84 | 1.41 |
| C.D@0.5% | 1.50 | 1.84 | 3.08 |

**Conclusion:**

From the present study, it was concluded that the application of Chitosan at 10 ppmincreases berry weight, bunch weight and yield per vine.In addition, the application of Naphthalene acetic Acid at 100 ppm concentration at pre veraison stage significantly reduced the berry drop and increasestheshelflifeof Sudhakar seedless grapeswhich representserious problem inthis variety.

**Reference: -**


1. A.O.A.C.,1985.AssociationofOfficialAnalyticalChemistsEditedbyS.Williams,Association of Official, Analytical Chemists.
2. Artes-Hernandez, F., Tomas – Barberan, F.A.; Artes, F. 2006. Modified atmospherepackaging preserves quality of $SO_2$ – free "Superior seedless" table grapes.PostharvestBiol. Technol.2006, 39, 146-154.
3. Beerh OP, Krishnamurthy CV, Narasimham P,Girdhar Nand Raghuramai ahB,1976. Effect of Pre-and post-harvest treatments control some corrmon disorders inAnab-eShahigrapes.Journalof FoodScienceandTechnology13: 129 -132.
4. Domínguez, I., Ferreres, F., Riquelme, F.P., Font, R., Gil, M.I., 2012. Influence ofpre-harvest application of fungicides on the post-harvest quality of tomato (*Solanumlycopersicum*L.). Post-harvestBiol. Technol. 72, 1–10.
5. Dass H C, Randhawa G S and Negi S P 1974, Effect of growth regulators on post-harvestberrydropinCheemaSahebigrape.IndianJournalofHorticulture31:131-4.
6. ManishPrajapatiandDeviSingh.,2018.EffectofPlantGrowthRegulatorsonFlowering, Fruit Growth and Quality of Guava (*Psidiumguajava*L.) cv. AllahabadSafeda.Int.J.Curr.Microbiol.App.Sci (2018)SpecialIssue-7: 3355-3361.
7. Mahumud,T.M.M.,Eryani,R.A.,Syed,O.S.,Mohamed,A.R.,Eryani,A.LandAbdul, R. (2008). Effect of different concentration and application of calcium onstoragelifeandphysic-chemicalcharacteristicsofpapaya(CaricapapayaL.)Am.J.Agric.&Biol. Sci.,3(3):526-533.
8. Rossetto, M, McNally J, Henry RJ. Evaluating the potential of SSR flanking regionsforexaminingrelationships in Vitaceae.Theo AppGen 2002;104:61-66.
9. RosierCL,FramptonJ,GoldfarbB,BlazichFA,WiseFC.GrowthStages,Auxintype and concentration Influence Rooting of Stem Cuttings of Fraser Fir. HortSci2004; 39:1397-1402.
10. Ranjit Kumar, Gupta O.P., and Kumar R. (1987). Effect of pre harvest application offungicidegrowthregulatorsandcalciumnitrateonstoragebehaviourperlettegrapesat low temperature. Haryana Agricultural University Journal of Research, 17(1): 30-38.

11. Samatha,T.,R.Shyamsundarachary,P.Srinivas,andN.R.Swamy.2012.Quantificationoftotalphenolicandtotalflavonoidcontentsinextractsof OroxylumIndicumL.Kurz. AsianJ. Pharm. Clin.Res.5:177–179.
12. Shanta Krishnamurthy. 1985.Factores affecting storage of grapes. Proceeding of theNationalworkshop onpost-harvest managementof grapes 129-134.
13. Sharma, J., and A.K. Upadhyay. Effect of moisture stress on performance of ownrootedandgraftedvinesofTas-A-Ganesh(VitisviniferaL.)VIIinternationalsymposium on temperate zone fruits in the tropics and subtropics. ISHS Acta. Hort.2005.662.
14. Singleton, V. L., and Joseph A. Rossi. 1965. "Colorimetry of Total Phenolics withPhosphomolybdic-Phosphotungstic Acid Reagents."*American Journal of EnologyandViticulture*16(3).
15. Zhu Y., Yu, J., Brecht, J.K., Jiang, T., Zheng, X., 2016a. Pre-harvest application ofoxalic acid increases quality and resistance to *Penicilliumexpansum*in kiwifruitduringpostharvest storage. Food Chem. 190, 537
16. Zoffoli J.P., Latorre, B.A., Naranjo, P., 2009. Preharvest applications of growthregulatorsandtheireffectonpost-harvest qualityoftable grapesduringcoldstorage.PostharvestBiol. Technol. 51, 183–192.0