

Perennial Horticulture Development Project
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Gibberellin application on table grape (Keshmeshi) in the Shomali plain (Guldara district), Kabul, Afghanistan 2008

Introduction

Grapes and raisins are, by value and volume, the most important perennial fruit crop in Afghanistan, with an estimated production value of US \$180 Million in 2003.

An increasingly important late season production area for table grapes for the Kabul market, and occasional exports, is the Shomali plain. The main variety traditionally for raisin grape production has been the Keshmeshi grape, with a more recent introduction of the Shundukhani variety from Kandahar. The Keshmeshi grape is reputedly the original variety taken around the world as Thompson Seedless.

Due to the absence of seeds, the Keshmeshi and Shundukhani grapes (like all seedless varieties) tend to produce small berries which are less acceptable on the fresh market, and can only achieve low prices. The technology to improve berry size and marketability of seedless grapes was already common practice around the world by the 1960s, using the naturally occurring plant hormone gibberellic acid or GA3. Many growers in the Shomali area (the horticulturally productive plain north of Kabul) use GA3, albeit in a haphazard and sometimes counterproductive way. The current problems include wrong timing of GA3 applications, and overdosing, which can promote tight berry clusters and introduction of fungal rots. GA3 is readily available in agricultural supply merchant stores, in tablet form.

The trial undertaken in 2008 tested different doses of GA3, and different timings, based on well documented practice around the world. The application of the GA3 was combined with another potentially beneficial practice, namely the tipping of the green shoot cane, so that more metabolites were directed to the developing fruit cluster, rather than in excessive vegetative growth. The results obtained confirmed that the standard rate of 60 ppm for the Keshmeshi grape in Shomali was an appropriate treatment for maximizing returns to the farmers. Recommendations are made for ensuring that the farmers are fully aware of this technology, and use it correctly and effectively.

The Trials

There were two trials on the application time of gibberellin. The first trial was application of gibberellin at flowering time. As expected, this time of application reduced yield. The action here is to thin the berries in the bunch. This could be advantageous for certain varieties of

grape with very tight clusters, where thinning the bunch can reduce rots and other problems. This has no beneficial effects on the Keshmeshi grape, and is not described further.

The second or main trial of the gibberellin application was made at fruit set. The individual berries in the bunch were the size of mung bean. Solutions of gibberellin at the correct concentrations were made up by dissolving commercially available gibberellin powder of 20% active ingredient at the correct dose in water. The gibberellin solution was applied to the bunches of grapes until the bunches were soaked, using a two litre sprayer commonly used for this purpose. Each treatment was applied to three plants on 4th June 2008. The trial was harvested on 7th October 2008.

The fruit from each vine was weighed, and Brix (sucrose content) readings were taken using a refractometer. Three people were asked to taste grapes from each treatment, and the acceptability of taste was assessed. The taste of the treatments were acceptable, except for the highest dose of gibberellin of 80ppm, where the taste was too flat. This acceptability is closely linked to sweetness, as measured by sugar content using the refractometer. A trader was asked to make an estimate of farm gate price of the different qualities from the different treatment. The price estimates were made mainly on visual appearance. The larger grapes from the gibberellin treatments were much more attractive than the untreated.

Table 1: The effect of GA3 concentration on yield and quality of Keshmeshi grapes

GA 3 concentration	Mean Yield Kg per plant	Total Yield Kg/ Jerib	Brix %
0	13.1	4,192	25.2
20 ppm	16.6	5,312	23.8
40 ppm	15.0	4,800	23.2
60 ppm	21.1	6,752	22.6
80 ppm	22.3	7,136	20.2

Plant spacing was 2.5 m x 2.5 m, making 320 plants per jerib (2,000 sq.m.)

Table 2: The effect of GA3 concentration on returns for fresh Keshmeshi grapes

GA 3 concentration	Price estimate Afs/kg	Total Yield Kg/ Jerib	Sales value Afs: / Jerib
0	18	4,192	75,456
20 ppm	22	5,312	116,864
40 ppm	22	4,800	105,600
60 ppm	23	6,752	155,296
80 ppm	22	7,136	156,992

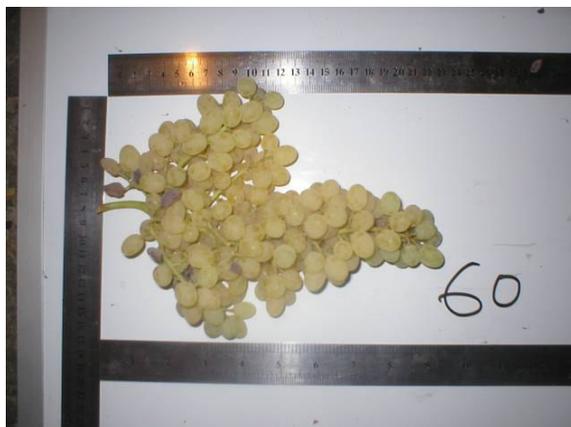
Discussion

Increasing concentrations of GA3 increased the size of berries over the range of the experimental concentrations, with corresponding reduction of sweetness. Since the market needs sweet grapes, the treatments effectively delay the date for marketing the fruit.

The most effective treatment, which gave a substantial increase in yield, without unacceptable reduction in sweetness of the fruit, was the treatment of gibberellin at 60 parts per million (60ppm). The yield increase was 61% and the price increase was 28%, more than doubling the return to the grower. Calculated on a per jerib basis, the increase in return to the farmer was 79,840 Afs. At the existing exchange rate of 50 Afs = US\$1.00, the increased return per jerib was nearly \$1,600.

The cost of application of gibberellins is negligible. A 10gm tablet of gibberellins, containing 1200mg of active ingredient, costs \$1.00. Not more than five tablets would be needed per jerib. A plastic bucket to mix the treatment, and a small sprayer are the only other equipment needed, and one day's labour at not more than 300 Afs per day per jerib..

No treatment



Treated with GA3 at 60ppm



Figure-3: Keshmeshi grape treated with GA3

Treated with 60 ppm GA3



Treated with GA3 at 60 ppm



Figure-4:Keshmeshi grape treated with

Recommendations

The 2008 trial by PHDP in Shomali plain north of Kabul verified the standard practice of gibberellins usage can provide substantial returns to grape growers at negligible cost. Noor Brothers Company sells every year more than 100,000 tablets of GA3 by the name of Gebrilan 12%. The weight of the tablet is 10gm, it contains 1200 milligrams of active ingredient. When dissolved in 20 litres of water, the correct concentration of 60ppm is obtained.



GA3 tablet by the name of Gebrilan 12 % active ingredient

Unfortunately, the GA3 tablets are sold without any information about how to use them, even though the tablet is nicely packaged as shown. This package is again contained in an outer box, which contains no further information on it.

The tablet in the packet shown is highly soluble in water. The whole tablet should be dissolved in 20 litres of water, or one quarter tablet dissolved in 5 litres of water to make the correct 60 ppm solution.

In Shomali plain the grape growers are using small two litre sprayers to spray the bunches. Without any instructions on how to use the gibberellins they can be using one tablet (1.2 gr active GA3) in two litres of water. This gives a concentration ten times that recommended, and the resulting grapes have very tight bunches with no taste and possible incident of fungal diseases. Negative impacts on the following year's crops are also incurred.

PHDP will prepare the text of an instruction leaflet (in Dari & Pashto) to put into the box of the gibberellin. It is up to the seller (Noor Brothers Company) to include the leaflet and inform customers how to use the hormone.