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Research Article

Effect of Diammonium Phosphate (DAP) Concentration on physicochemical parameters of Banana wine

Shivraj B Patil, Pravin G. Paul[1] and Santosh M. More*

Yeshwant Mahavidyalaya, Nanded, Maharashtra, India-431605
[1]N.E.S. Science College, Nanded, Maharashtra, India-431 605.
*Corresponding Author:drsanmore@gmail.com

ABSTRACT

Banana (*Musa* Spp.) is one of the most important commodity in terms of volume of trade. Banana is cultivated in more than 150 Countries across world. Banana must is often supplemented with diammonium phosphate (DAP) to reduce stuck fermentation. However, nitrogen-deficiency results in poor quality banana wine. Sensory evaluation revealed that DAP supplementation kept the unique aroma and taste of fresh wine. DAP supplementation can benefit the quality of produced banana wine.

Key words: banana wine, diammonium phosphate, fermentation

INTRODUCTION

Nitrogen is one of the most important nutrients required for the growth of yeasts which also affects wine fermentation. Nitrogen is usually provided in the form of diammonium phosphate (DAP) to be used as a readily assimilable nitrogen and additional phosphorus, which is another essential element that may be deficient.

Stuck and sluggish fermentations are a major problem in wine industry that leads to spoilage of wine. Low levels of nitrogen are often the cause of problem during the process of fermentation. To address this issue, diammonium phosphate (DAP) is commonly used as a fermentation activator in banana must. DAP as an ammonium supplement can directly influence the metabolism of amino acids during wine fermentation. In this study, DAP at various concentrations was added to the fermenting banana must.

MATERIAL AND METHODS

Preparation of Banana must

Banana fruits were washed with tap water, hand peeled, cut in to thin slices and then grind in mixer. This pulp homogenate was then mixed with water in 1:1 proportion. To this 0.02 % of pectinase enzyme and 100 mg/L KMS were added and the mixture was held at room temperature for 4 h. Pectinase treated juice was then chaptalized to 19 ^{O}Brix using table sugar,

DAP at a concentration of 100 mg/L was added to this and its pH was adjusted to 3.5 using citric acid and calcium carbonate. Then it was kept at 10 ^{O}C until required

Preparation of inoculum of Standard yeast cultures:

Healthy white and red grapes and standard yeast strains of *Saccharomyces cerevisiae* (NCIM 3215 and NCIM 3604) procured from NCIM, Pune, Maharashtra were used for preparation of inoculum. The grape fruits were homogenized in a mixer grinder and homogenized grape musts were directly used as an inoculum for fermentation of banana must. The standard yeast strains were first inoculated in yeast extract peptone dextrose broth (HiMedia, Mumbai) and allowed to grow at 30^{0}C for 24 h. These activated broth cultures of yeasts were then transferred (at concentration of 1%, v/v) separately to prepared banana must and allowed to grow at 30^{0}C for 24 h.

Fermentation experiment:

Four hundred ml aliquots of banana musts were inoculated with 40 ml each of red and white grape musts which were prepared by grinding the red and white grapes respectively in duplicates. The standard yeast strains were used as an inoculum at a concentration of 1% (19 mL inoculum in 1900 mL banana musts) for the fermentation banana must separately. The activated inoculum had cell density of ~1.6 x 10^{8} cfu/mL (NCIM 3215) and ~2.0 x 10^{9} cfu/mL. After inoculation the fermentation was allowed to continue at 20 ^{O}C for about 22 days. Progress of fermentation was monitored by observing total soluble solid profile of the must.

Effect of Diammonium phosphate (DAP) concentration (mg/L):

To study the effect Diammonium phosphate concentration the pH of the must was adjusted to 3.6-3.65 and it was distributed in 200 ml aliquots in 250 ml flasks. The musts were then supplemented with DAP at a concentration of 50, 100, 150, 200 and 250 mg/L.

RESULTS:

Effect of DAP concentration on various physicochemical parameters of wine:

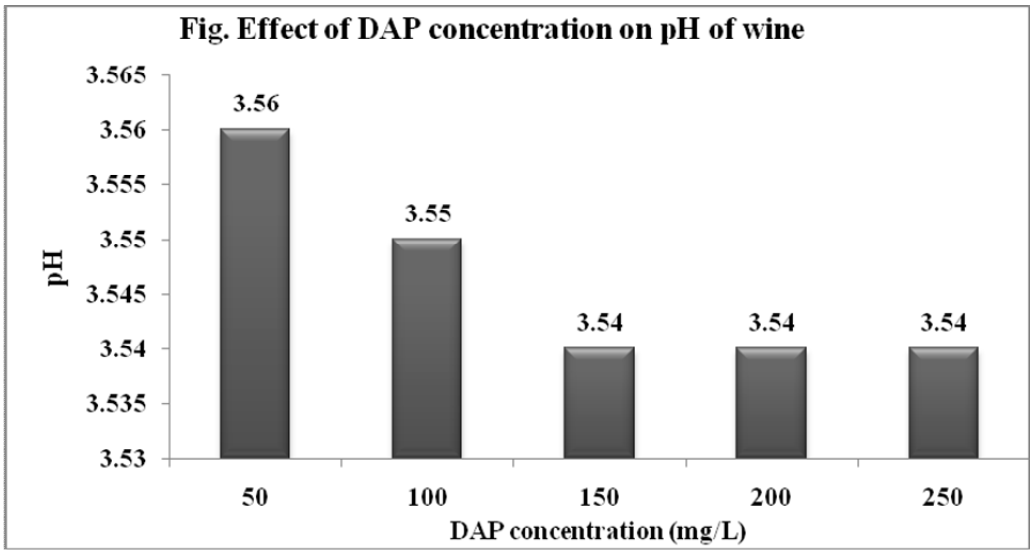
Diammonium phosphate (DAP) is usually used as additional nitrogen required for the growth of yeasts. If there is less nitrogen then fermentation process may stop, leading to a stuck fermentation and high concentration of residual sugar (Considine and Frankish, 2014). DAP is used generally at a concentration of 100-200 mg/L of must. Thus we have investigated the effect of DAP concentration on various physicochemical parameters of banana must fermentation.

Table. Effect of DAP concentration on physicochemical parameters of banana wine.

DAP Conc. (mg/L)	pH	°Brix	SG	Alcohol (%)	TA (%)	VA (%)	RS (%)
50	3.56	5	0.9965	4.44	0.53	0.014	0.005
100	3.55	5	0.9965	5.64	0.54	0.016	0.005
150	3.54	5	0.9965	5.64	0.50	0.014	0.003
200	3.54	5	0.9963	5.76	0.56	0.015	0.004
250	3.54	5	0.9961	5.90	0.52	0.015	0.004

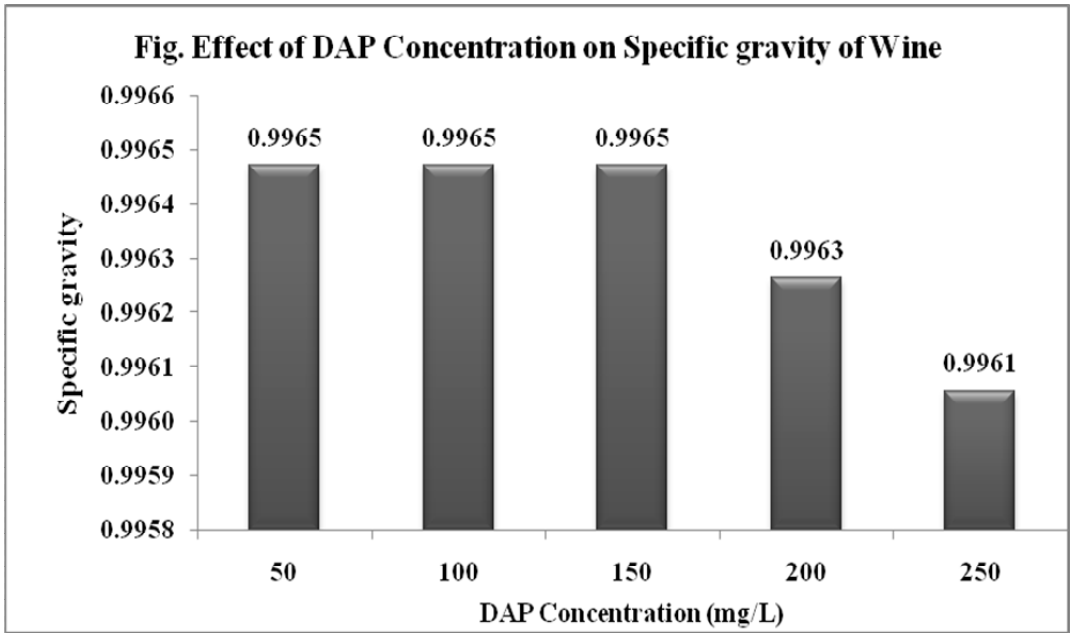
SG; Specific gravity, VA; Volatile acidity, TA; Titratable acidity, RS; Reducing sugar

a) **Effect of DAP concentration on** pH **of wine**: pH of wines fermented at different DAP concentrations was found to be almost same. With increase in DAP concentration from 50 to 150 mg/L slight increase in pH was observed. pH of fermented must with DAP concentration from 150 to 250 mg/L was found to be same. Onwuka and Awam (2001) added DAP at 0.12 % concentration and reported the value of pH within the range of 3.40-4.10 for wine produced from banana, cooking banana and plantains.



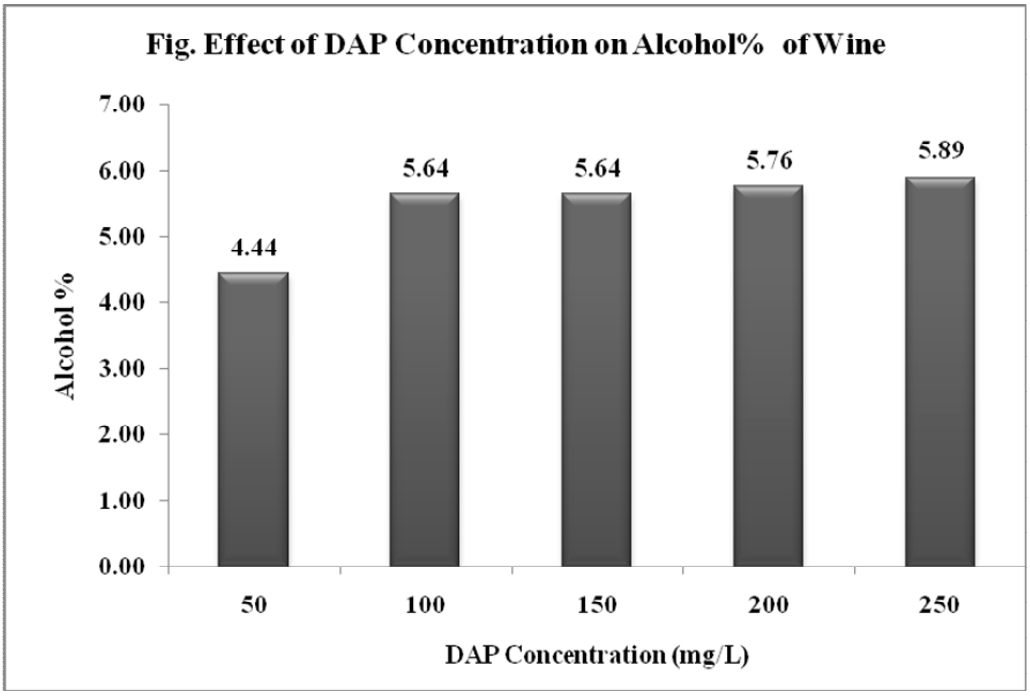
b) **Effect of DAP concentration on Specific gravity of wine**

Specific gravity was found to be almost same in wines fermented at different DAP concentrations. Onwuka and Awam (2001) reported the value of specific gravity within the range of 0.9850-0.9866 for wine produced from banana, cooking banana and plantains. Specific gravity of banana wine in our study was found to be higher than reported by these authors. This could be attributed to higher alcohol % in wine prepared by them.



c) **Effect of DAP concentration on Alcohol Percentage of wine**

With increase in DAP concentration percentage of alcohol in must was found to be increased after fermentation within a range of 4.44 to 5.90 %. Alcohol percentage was found to be highest and lowest in must containing 250 and 50 mg/L of DAP respectively.



DISCUSSION:

Then pH of fermented musts at different DAP concentrations was found to be almost same. Increase in DAP concentration from leads to slight increase in final pH. No large difference in specific gravity was observed in wines fermented at different DAP concentrations. Specific gravity of banana wine in present study was found to be higher than reported by these authors. This could be attributed to higher alcohol % in reported wine. With increase in DAP concentration percentage of alcohol in must was found to be increased after fermentation.

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