Investigations into the effects of a commercial organic fertilizer and of quality compost on the soil and the vines

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INTRODUCTION

Organic fertilizers supply organic matter as food for the soil organisms (`nutrient humus`) to the soil and are base materials for the formation of humus. With the organic fertilizers also nutrients are delivered to the soil and therefore they are an important contribution to the nutrient supply to the vines. In our studies high-grade compost A⁺ as a product of the municipal organic bio-waste with shrub trimmings and a commercial organic fertilizer based on dry mash from bioethanol production, blackstrap molasses, vinasse, PNC (potato nitrogen concentrate) and CSL (corn steep liquor) should contribute to the humus and nutrient supply of the soil and the vines. To evaluate the effects of application of the mentioned products the humus content and the nitrogen content in the soil were analyzed. Yield, must weight, content of titratable acids in the must and yeast assimilable nitrogen were determined to get information about possible influences on yield and must quality. The influence on the vigor of the vines was evaluated by determining pruning wood weight.

MATERIAL and METHODS

Table 1: Experimental vineyards.

Location	Harrer I			Steinriegel Q 28
Grape variety	Pinot Noir	Blaufränkisch	Blauburger	Riesling
Planting year	2002	2002	2002	2000
Plant spacing	3,00 m x 1,00 m			

Table 2: Application rates (extrapolated in tons per hectare) and application dates of the organic fertilizers.

Date	Application rate (tons per hectare)	
	Quality compost	Commercial organic fertilizer
12.03.2013	15	3.8
14.03.2014	15	1.9
15.03.2015	15	1.0
17.03.2016	15	1.0
22.03.2017	15	1.9
03.04.2018	15	1.9

Figure 1: Partial area of the experimental vineyard after the application of quality compost.

Figure 2: Partial area of the experimental vineyard after the application of the commercial organic fertilizer.

Characterisitics of the soil of the experimental sites: Calcerous brown soil on flysch-marl, skeleton: 10 – 20 %, clay: 25 – 34 %, silt: 38 – 51 %, sand: 15 – 37 %

Soil sampling in the years 2012 and 2018 (pH-value, potassium content, humus content) and annual soil samples (mineral nitrogen): On Julyrd 2012 and August 29th 2018 soil samples for analyzing pH-value ($CaCl_2$), potassium content (calcium-acetate-lactate-extract) and humus content (= organic matter) were taken. Number of samples per date: 12 (3 variants x two replications x 2 plots) with 6 penetrations per replication. // Soil samples for analyzing mineral nitrogen content (6 penetrations per replication) from the depth 0 – 60 cm were taken on the following dates: July 4th and Sept. 5th 2013, June 26th and August 27th 2014, July 7th and August 20th 2015, June 28th and Sept. 7th 2016, Sept. 8th 2017 and June 26th and August 29th 2018. The analysis were performed at the Austrian Agency for Health and Food Safety.

Determination of yield, ripeness parameters and pruning wood weight

The determinations of yield, bunch weight, must weight, pH-value and content of titratable acids, nitrogen (OPA/NAC) and potassium in the must were performed according to the experimental design. Four replications per variant were evaluated with the varieties `Pinot noir`, `Blaufränkisch` and `Blauburger` and eight replications per variant were evaluated with the variety `Riesling`. Just before harvesting the grapes, berry samples for analyzing the ripeness parameters were taken. Immediately after harvest, yield was determined directly in the plots with a portable scale. Must extraction was performed by a centrifugal juice extractor and the filtration of the musts was performed by using folded filters. Sugar content in the must was determined by using a refractometer and acidity in the must by titration with 2/15 normal blue indicator. The nitrogen content in the must was determined photometrically: the free α – amino groups formed a blue dye with the reagent o-Phtalaldehyd/N-Acetyl-Cystein (OPA/NAC). The intensity of the blue dye at 340 nm was measured by using the photometer Konelab 20. Potassium content was determined by using the atomic absorption spectrometer Unicam U 939. Pruning wood was weighed according to the experimental design by using a portable mechanical `pull – scale`. For this determination the one-year-old and two-year-old pruning wood was taken into account.

RESULTS and DISCUSSION

Because of the annual application of 15 t/ha quality compost A⁺, humus content in the topsoil (0 to 30 cm) increased from 2.9 % to 3.7 % on one site and from 3.4 % to 4.1 % on the second site. The application of the annual differing amounts of 3.8 t/ha, 1.9 t/ha and 1.0 t/ha of the commercial organic fertilizer indicated no change or a slight increase of the humus content depending on the site, respectively. In the subsoil (30 to 60 cm) at no site and with no organic fertilization method significant changes of the humus content could be analyzed. At both sites significant differences between the mean values of the mineral nitrogen contents in the soil (0 to 60 cm) of all sampling dates and of all years of the three experimental variants could be determined. The mean values were 18.9 kg/ha and 41.7 kg/ha (control), respectively, 30.6 kg/ha and 44.1 kg/ha (quality compost A⁺), respectively, and 46.5 kg/ha and 95 kg/ha (commercial organic fertilizer), respectively. Between the single sampling dates strong differences were recognized with the contents of mineral nitrogen in the soil depending on soil temperature and soil moisture. Depending on the grape variety and the year, the contents of yeast assimilable nitrogen and of total nitrogen in the musts increased in part significantly because of organic fertilization. On average of all grape varieties and years, nitrogen content in vine leaves of the control variant was 2.35 %. It was significantly lower than in the vine leaves of the variants quality compost A⁺ and commercial organic fertilizer with 2.50 % and 2.55 %, respectively. With yield, the maturity parameters and pruning wood weight significant differences between the experimental variants were recognized only in some years and with some varieties. The grapes of two varieties were microvinified and the wines organoleptically rated. With the variety 'Blaufränkisch' the wines from the quality compost A⁺ variant were rated significantly better. In summary, the following can be said: Whereas the application of quality compost A⁺ did not only positively influence the nitrogen supply of the vines, but also increased the humus content, the commercial organic fertilizer primarily contributed to the nitrogen supply of the vines.

LITERATURE

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