# Virginiamycin and growth performance in beef cattle

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SUMMARY: To compare Virginiamycin (VM) and Monensin Sodium (MS) effects on beef cattle growth performance, 63 Salers bulls (x=353 kg) were divided in three groups (3 replications for treatment) and fed as follows: MS 150 (control), VM 75 and VM 150 mg/head daily. Both during the "grower" (129 d) and the "finisher" phase (59 d), liveweights were recorded individually and feed intake by pen (7 bulls).

In the "grower" phase average daily weight gain (DWG) were 1329, 1364 (+2.6%) and 1444 (+8.7%, P=0,08) g and feed conversion ratio (FCR) 7.01, 6.89 (-1.7%) and 6.63 (-5.4%) for control, VM 75 and VM 150, respectively. In the "finisher" phase average DWG and FCR were: 1055, 1149 (+8.9%), 1101 (+4.4%) g and 8.84, 8.23 (-7.9%), 8.42 (-5.8%) for control, VM 75 and VM 150, respectively. Global DWG and FCR were: 1248, 1300 (+4.2%), 1332 (+6.7%) g and 7.53, 7.27 (-3.5%), 7.09 (-5.8%) for control, VM 75 and VM 150, respectively. Dressing percentages at slaughter were similar in all groups. Virginiamycin positively affected growth performance with a dose response effect.

INTRODUCTION: The integration of beef cattle diets with feed additives which can improve performance is widespread adopted by intensive feeding systems. Particularly, Monensin Sodium (MS) mode of action in modifying ruminal volatile fatty acids (VFA) production has been deeply investigated by many researchers: in most of such works MS proved to be effective in increasing the molar percentage of propionic acid at the expense of acetic acid proportion (BARTLEY et al., 1979; BEEDIE et al., 1977; BERGEN et al., 1984; JOHNSON et al., 1979; PIANA et al., 1981; PIVA et al., 1986; RICHARDSON et al., 1976; SCHELLING, 1984; SHELL et al., 1979). As a result MS improves energy balance and efficiency and, consequently, the feed conversion ratio (FC) more than liveweight gain (LWG) (BARTLEY et al., 1979; GOODRICH et al., 1984; JOHNSON et al., 1979; POTTER et al., 1985; SCHELLING, 1984; SHELL et al., 1979). MS also decreases the production of lactic acid (BERGEN et al., 1984; DENNIS et al., 1981; GOODRICH et al., 1984; SCHELLING, 1984). More recently the effect of Virginiamycin (VM) has been investigated in beef cattle feeding. It appears that VM can enhance propionic acid not only as a molar proportion, but also as total production, with little effect on acetic acid production (PIVA et al., 1981); particularly NAGARAJA et al. (1987) found that VM, at low concentration in vitro, increased the molar proportion of propionate and at high concentration decreased it.

VM acts strongly against lactic acid producing bacteria, thus reducing acidosis occurrence in the rumen (BALLARINI et al., 1986). Furthermore VM seems to inhibit proteolysis in vitro (VAN NEVEL et al., 1987)

The purpose of this study was to evaluate the effect of VM at half dose and at the same dose but without Na bicarbonate, compared to MS, on weight gain, feed conversion, dressing percentage and liver status in beef cattle.

MATERIALS and METHODS: 63 Salers bulls imported from France at the average liveweight (LW) of 353 kg were divided into three groups of 21 heads each, assigned to the following treatments: group C (control): Monensin Sodium (MS) 150 mg/head daily; group VM 75: Virginiamycin (VM) 75 mg/head daily; group VM 150: Virginiamycin 150 mg/head daily, no Na bicarbonate.

Two diets were fed during the trial: "grower" (129 days, 353-555 kg LW) and "finisher" (59 days, 555-620 kg LW) (tab. 1).

Group C and group VM 75 diets included 60 and 90 g Na bicarbonate/head daily in the "grower" and the "finisher" phase, respectively.

Three days after their arrival the bulls were individually weighed, tagged, dewormed, vaccinated for respiratory diseases and randomly assigned to treatments. After 11 days of adaptation diet (with MS and VM at half dose) every animal was weighed again and assigned, according to LW, to each of 9 pens (of 7 bulls each) which provided 3 replications for each treatment.

Access to water and feed was free and ad libitum. The feed (total mixed ration) was distributed once a day, in the morning.

All the data of the trial refer to the experimental period (188 days) excluding the first 11 days (adaptation period).

Feed consumption of each pen was recorded every two days and the quantity of diet fed was adjusted to appetite accordingly. Every animal was weighed, without fasting, every 43 days during the "grower" phase and at the beginning and at the end of the "finisher" phase. Feed conversion ratio (FCR) calculated as dry matter intake (DMI)/liveweight gain (LWG) was registered for every interval between consecutive weighings.

Animal health was carefully checked daily during the trial.

Differences between treatments were analyzed by means of covariance analysis, General Linear Model (SAS, 1988).

RESULTS and DISCUSSION: During the trial 3 animals (1 of control, 2 of group VM150) had to be deleted since they were recalcitrant to be weighed. Two more animals (1 of control, 1 of group VM150) were also deleted due to traumatic leg injuries occurred during the second weighing. Hence the trial was effectively performed on 58 animals: 19 of the control group, 21 of the VM75 group and 18 of the VM150 group.

Table 2 shows average liveweights during the trial. The starting liveweights are homogeneous on average, but considering the standard deviation values, a fairly high variability among animals of the same group can be noted. Such a variability (to a lesser extent in the VM150 group) negatively affected statistical differences between treatments.

Feed intakes by phase are reported in table 3. VM-groups had higher feed intakes during the "grower" phase: 9.34, 9.45, 9.54 kg DMI/daily for control, VM75 and VM150 groups, respectively; these values correspond to +2.5%, +3.7% and +4.7% of the foreseen feed intake (9,14 kg DMI, table 1). During the "finisher" period feed intakes were 9.51, 9.46, 9.22 kg DMI/daily for control, VM75 and VM150 groups, respectively which correspond to +8.7%, +8.1%, +5.3% of the estimated feed intake. None of the differences was statistically significant.

Table 4 summarizes DWG and FCR by phase, while table 5 reports percentage differences and significativity of the test groups versus control.

The positive influence of Virginiamycin and its dose response effect on growth performances is evident in the "grower" phase: 1329, 1364 (+2,6%), 1444 (+8,7%, P=0,08) g DWG and 7.01, 6.89 (-1.7%), 6.63 (-5.4%) FCR for control, VM75 and VM150, respectively.

In the "finisher" phase the growth rate decreased, as could be expected: test groups still performed better than control, with VM75 having the best growth performance: 1055, 1149 (+8,9%), 1101 (+4,4%) g DWG and 8.94, 8.23 (-7.9%), 8.42 (-5.8%) FCR for control, VM75 and VM150, respectively.

Considering the entire period of the trial (188 days) the DWG were: 1248, 1300 (+4,2%) and 1332 (+6,7%) g DWG and 7.53, 7.27 (-3.5%), 7.09 (-5.8%) FCR for control, VM75 and VM150 treatments, respectively.

These values are satisfactory and, despite the lack of a significance, the differences of the VM groups versus control are remarkable, especially if we consider that the control was not a negative one, but treated with a growth enhancer.

No differences between treatments could be seen for dressing percentage (hot carcass weight/final LW): 60,2, 60,6 and 60,0 for C, VM75 and VM150 groups. No liver abscesses were detected in any treatment. Also the lungs, the kidneys and all the organs did not show any pathological sign.

CONCLUSIONS: The data obtained in this trial, in agreement with PARIGI BINI (1979), confirm a positive effect of Virginiamycin on growth performance of beef cattle. The best results were obtained with the highest VM level (150 mg/head daily). None of the 58 subjects showed any pathological sign which could be related to a subclinical acidosis status;the fact that health status was the same for all groups (included VM 150 one, which received a diet with no Na bicarbonate supplementation) seems to confirm the claimed antiacidotic effect of Virginiamycin in beef cattle.

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Tab. 1 - Composition and analysis of the diets.

| PHASE | "GROWER" (129 d) | | "FINISHER" (59 d) | |
|---|---|---|---|---|
| Maize silage | 13,6 | | 11,1 | |
| Wheat straw | 0,9 | | 1,1 | |
| Soybean meal | 0,9 | | 0,7 | |
| Corn gluten feed | 0,9 | | 0,7 | |
| Rice bran polish | 1,1 | | 1,3 | |
| Cane molasses | 0,6 | | 0,7 | |
| Maize grain | 0,4 | | 0,8 | |
| Barley grain | - | | 0,8 | |
| Vit/min supplement | 0,2 | | 0,3 | |
| ANALYSIS: | | | | |
| kg as fed | 18,6 | | 17,5 | |
| % DM | 49 | | 50 | |
| kg DM | 9,14 | =100% | 8,75 | =100% |
| UFV/kg DM | 0,83 | | 0,85 | |
| CP (% on DM) | 14,5 | | 14,4 | |
| EE (% on DM) | 4,3 | | 4,3 | |
| NDF (% on DM) | 41,1 | | 36,6 | |
| ADF (% on DM) | 23,9 | | 18,8 | |
| Starch+sugars (% on DM) | 22,6 | | 25,8 | |
| Ca (% on DM) | 0,56 | | 0,59 | |
| P (% on DM) | 0,40 | | 0,35 | |

Tab. 2 - Liveweights of the animals during the trial (kg)

| days of trial | CONTROL | VM-75 | VM-150 |
|---|---|---|---|
| 1 | 378,1± 25,2 | 378,9± 24,3 | 374,3± 21,1 |
| 43 | 432,1± 28,7 | 435,4± 34,2 | 435,7± 24,9 |
| 86 | 494,0± 35,3 | 499,4± 40,9 | 506,3± 29,4 |
| 129 | 550,0± 44,2 | 555,5± 42,0 | 560,1± 30,5 |
| 188 | 612,7± 44,3 | 623,3± 42,8 | 624,7± 23,5 |

Tab. 3 - Feed intakes by phase. The % values refer to the difference versus the diet reported in tab. 1.

| PHASE | | CONTROL | VM-75 | VM-150 |
|---|---|---|---|---|
| GROWER | DM (kg/d) | 9,34 | 9,45 | 9,54 |
| (129 days) | % | 102,5 | 103,7 | 104,7 |
| FINISHER | DM (kg/d) | 9,51 | 9,46 | 9,22 |
| (59 days) | % | 108,7 | 108,1 | 105,3 |
| TOTAL | DM (kg/d) | 9,39 | 9,45 | 9,44 |
| (188 days) | % | 104,4 | 105,0 | 104,9 |

Tab. 4 - Daily weight gain (DWG) and feed conversion ratio (FC, "kg DM/kg DWG") by phase.

| PHASE | | CONTROL | VM-75 | VM-150 | RSE |
|---|---|---|---|---|---|
| GROWER (129 days) | DWG (g) (1) | 1329 | 1364 | 1444 | 26 |
| | FC | 7,01 | 6,89 | 6,63 | 0,19 |
| FINISHER (59 days) | DWG (g) (2) | 1055 | 1149 | 1101 | 28 |
| | FC | 8,94 | 8,23 | 8,42 | 0,42 |
| TOTAL (188 days) | DWG (g) | 1248 | 1300 | 1332 | 19 |
| | FC | 7,53 | 7,27 | 7,09 | 0,16 |

(1) means adjusted for the initial liveweight
(2) means adjusted for liveweight at the start of the finisher phase

Tab. 5 - Percentage differences versus control of the test groups and differences significativity (data calculated from table 4).

| PHASE | | CONTROL | VM-75 | VM-150 | P |
|---|---|---|---|---|---|
| GROWER (129 days) | I.P.G. | 100,0 | 102,6 | 108,7 | NS |
| | I.C.A. | 100,0 | 98,3 | 94,6 | NS |
| FINISHER (59 days) | I.P.G. | 100,0 | 108,9 | 104,4 | NS |
| | I.C.A. | 100,0 | 92,1 | 94,2 | NS |
| TOTAL (188 days) | I.P.G. | 100,0 | 104,2 | 106,7 | NS |
| | I.C.A. | 100,0 | 96,5 | 94,2 | NS |