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Research regarding of the utilization and promotion of some innovative technologies in the agro-zoo-veterinary field (biofertilizers, probiotics, imunomodulators)

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RESEARCH REGARDING OF THE UTILIZATION AND PROMOTION OF SOME INNOVATIVE TECHNOLOGIES IN THE AGRO-ZOO-VETERINARY FIELD (BIOFERTILIZERS, PROBIOTICS, IMUNOMODULATORS)

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Summary: *The paper has the role to promote certain sustainable production systems, diversified and balanced, in order to prevent pollution of agricultural crops, the environment, the conversion of agri-food waste (whey) into veterinary medical products as well as the implementation of green, non-polluting technologies in the agricultural sector, zootechnics and veterinary medicine. The purpose of this work is to present and use the newest innovative technologies into these fields and replace the traditional polluting products, so that the farmers can reaches a much greater potential over the recorded productions. The interest in green products and technologies and the achievement of high yields in the field of agro-zoo-veterinary has an upward trend in Romania. In order to support farmers in these fields, new organic products have appeared on the Romanian market meant to be used in the agro-zoo-veterinary field: biofertilizers, silage agents, probiotics and immunomodulators.*

Keywords: *biofertilizer, silage agent, probiotic, immunomodulator, Romvac Company S.A.*

JEL classification: *Q01, Q16, Q57.*

INTRODUCTION

Food safety, a normal objective for any man, farm and enterprise, is aimed to producing sufficient, varied and cheap food, corresponding to the physiological requirements and purchasing power of any person. In the developed countries, this objective has been achieved and often exceeded substantially by promoting intensive systems for both land cultivation, animal husbandry and veterinary medicine, as well as modern methods of processing and marketing agricultural products. Mechanization, chemization, animal husbandry technologies, technologies for applying treatments, growing plants and raising more and more productive animals, and modernizing processing and marketing systems have contributed, first and foremost, to improving human living conditions, as much as volume. and diversity of agri-food products, as well as accessible to buyers.

MATERIAL AND METHOD

The development and diversification of both green and environmentally friendly, innovative systems and technologies in the agro-zoo-veterinary field have become a landmark for both farmers and for the communities and companies involved in the projects for obtaining agro-food products of high biological value, technologies that have the role of minimizing the negative impact on the environment. The population growth and the increasing demand for food has led to the use of non-

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agricultural, polluting technologies for the environment and for the agro-zoo-veterinary sectors. Thus, in order to ensure organic products, unpolluted as well as agri-food safety, some companies in Romania have developed a series of ecological technologies, a series of innovative technologies that have the role of recycling certain wastes from the agri-food industry in order to obtain organic products. , biological products successfully used in the agro-zoo-veterinary sector (FAO, 2015).

In order to protect the environment and the agri-food health and safety of humans and animals, the company Romvac Company S.A has developed a series of innovative technologies with the help of the farmer have obtained certain ecological products for their use in the agro-zoo-veterinary field. The first products obtained by green technologies were those intended for the agricultural field: biofertilizer (Rom-Agrobiofertil NP) and silage agent (Bioromsil) based on bacterial culture. Rom-Agrobiofertil NP is an ecological fertilizer based on bacterial cultures (Figure 1). It occurs as a set of three bacterial strains: *Azospirillum lipoferum*, *Azotobacter croococcum*, *Bacillus megaterium* (Levandovschi et.al, 2017).

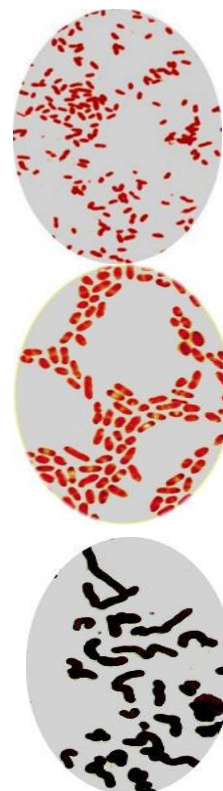
Figure 1 - Rom-Agrobiofertil NP biofertilizer bacterial strain set



Azospirillum lipoferum - Beijerinck strain 1925 - has the role of metabolizing organic materials from the soil (cellulose, hemicellulose, lignin, xylose). This bacterium multiplies and colonizes the plant roots by associating atmospheric nitrogen in the soil (Atilla, H.I, 2010) (Figure 2).

Azotobacter croococcum - Beijerinck strain 1901 - has the role of metabolizing free nitrogen from the atmosphere based on the energy resources existing in the soil. At the same time, the bacteria metabolize phosphates, assimilate and harvest the root exudates, counteracting the pathogenic microorganisms in the soil (Toader, George et al.) (Figure 3).

Bacillus megaterium - strain NCIMB 8508 - has the role of decomposing the detritus (complex compounds - chelations) in the soil. It converts insoluble phosphates from the soil into soluble, easily assimilated forms of plants, provides phosphorus and organic acids (lactic, glutamic, succinic, propionic) and enzymes, with biostimulatory action on plants (Chima, Ngumah, 2013) (Figure 4).



Bioromsil is a silage agent obtained by an ecological technology, a green technology by recycling an agro-food waste, namely whey. Bioromsil is composed of live strains - in equal parts - of *Lactobacillus plantarum* and *Enterococcus faecium*.

Bioromsil silage agent based on bacterial cultures is used for: rapidly lowering the pH (below 4.5) of the silo by increasing acidolactic fermentation of sugars and increasing lactic acid content, inhibits the growth of rot, mold and stops butyric fermentation, reducing fodder degradation, accelerates silo maturation by reducing fermentation period, ensures increased organoleptic quality of silo, improves animal production by increasing the conversion of animal feed, ensures probiotic flora in the entire apatogenic, non-polluting, non-polluting Romvac Company SA Prospect Bioromsil).

Figure 5 - BioRomSil silage agent



Romvac and the new series of bio products: zoo-veterinary domain

Whey is a major pollutant. The traditional milk processing technology does not allow the use of all milk components in finished dairy products, such as butter, cheese, casein, etc. Secondary products in the form of skimmed milk, whey and whey are inevitably obtained in the production process. In fact, whey and whey are an additional source of raw materials, which are part of secondary material resources and can be conventionally combined under the term - low fat dairy raw materials. Whey is a good basis for creating functional products of a new generation with a higher biological and nutritional value. From the perspective, in the creation of new food products with modified properties and compositions, the direction in the combination of dairy and vegetable raw materials is considered (Melescco, Sofia, 2018).

Going on the idea of obtaining BIO products by using waste from other fields of industry (whey in milk, molasses in sugar industry), Romvac specialists have created, in recent years, several natural products based on beneficial bacterial cultures and proteins whey bioactive, with probiotic and immunomodulatory role.

1. Bioenterom

All animal species are born with the sterile digestive tract. Probiotics are recommended for the first 3 days of life for intestinal colonization. BioEnteRom is a probiotic dietary supplement for stabilizing intestinal flora that contains live germs of *Enterococcus faecium* strain NCIMB 11181. The probiotic Bioenterom (figure 6) has the role of: stabilizing the digestion, increasing the conversion of food and nutrient absorption, increasing the weight gain in animals, reducing the level of toxins in the intestine, preventing

the proliferation of pathogenic germs *E. coli*, *Salmonella*, *Clostridium*, *Pseudomonas*.



Bioenterom is recommended in the following situations: administration before stress periods, sanitary-veterinary actions, in all gastrointestinal disorders associated with diarrhea for digestive tract digestion, during antibiotic therapy, oral administration in drinking water, colostrum or milk (Romvac Company SA - Prospectus Bioenterom).

1. Biolactorom

Biolactorom is a probiotic dietary supplement for stabilizing intestinal flora that contains live germs of *Lactobacillus plantarum* strain NCIMB 11974. The probiotic Biolactorom (figure 7) has the role of: stabilizing the digestion, increasing the conversion of food and nutrient absorption, increasing the weight gain in animals, reducing the level of toxins in the intestine, preventing the multiplication of pathogenic germs *E. coli*, *Salmonella*, *Clostridium*, *Pseudomonas* (Romvac Company SA - Prospect BioLactorom).



Biolactorom is recommended in the following situations: administration before stressful periods, sanitary-veterinary actions, in all gastrointestinal disorders associated with diarrhea for digestive tract digestion, during antibiotic therapy, oral administration in drinking water, colostrum or milk.

Romimunoactiv - immunomodulatory food supplement

The immunomodulatory Romimunoactiv (figure 8) is obtained from whey from mature immunological cows. It contains active substances such as: bioactive whey proteins > 10mg / l, lactoglobulin α , lactoglobulin β , immunoglobulins (IgA, IgG, IgE, IgM), lactoferin, lactoperoxidase, lysosyme, lymphokine. At the same time, its contents also identify the following excipients: lactose serum, mineral salts, vitamins, etc. The immunomodulator has significant antimicrobial action, acting as an antibiotic (Romvac Company S.A - Prospect Romimunoactiv).



RESULTS AND DISCUSSIONS

Following the testing of two innovative products from the portfolio of Romvac Company SA (Rom-Agrobiofertil NP and Bioenterom), both within certain research and development stations in agriculture, and within certain farms, both high yields per hectare were registered per hectare. certain agricultural crops, as well as a significant increase in the production increase in birds.

Thus, following the testing of the innovative products from the Romvac company both within the Research and Development Station in Buzau Vegetable (tomato culture „Florina 44”) and the testing of the probiotic Bioenterom within the Medgidia farm the following results were registered:

Table 1 - The total production registered in the “Florina 44” tomatoes in 2018 / ha in the field - Variant treated with Rom-Agrobiofertil NP

Nr. V/R	Nr. Ripe fruits / pl	Ripe fruit weight / pl (kg)	No. of green fruits / pl	Weight of green fruits / pl (kg)	Total fruit / plant production (kg)	Nr. total fruit / plant	Total production t / ha
Media V1	11,2	0,802	14,2	1,06	1,862	25,4	78,3
Media V2	13,3	1,251	22,25	2,1	3,351	35,55	132,6
Growth (%)	15,78 %	35,89 %	36,17 %	49,52 %	79,97 %	39,96 %	69,27 %

Source: Biometric data obtained at the Research-Development Station in Buzau Vegetables

Following the testing of the second product obtained by innovative total whey recycling technology (agro-industrial component considered a polluting waste) - Bioenterom strain *Enterococcus faecium* NCIMB 11181 - within Medgidia farm, applied to 230,000 bird heads.

Table 2 - Weight gain rate of birds (BioEnterom test)

Strain	0 days	7 days	14 days	21 days	28 days	35 days
NCIMB 10415 Period 03-05.2015 ~230.000 heads	42	197,4	487,1	904,6	1473,1	1723
NCIMB 1181(Bioenterom) Period 05-07.2016 ~230.000 heads	42	213,2	519,8	965,1	1528,8	1988,5
Growth (%)	0,0	8,0 %	6,7 %	6,7 %	3,8 %	15,4 %
				Growth/ g at 35 days	265,5	
				Growth g/ lot	61,065,00	

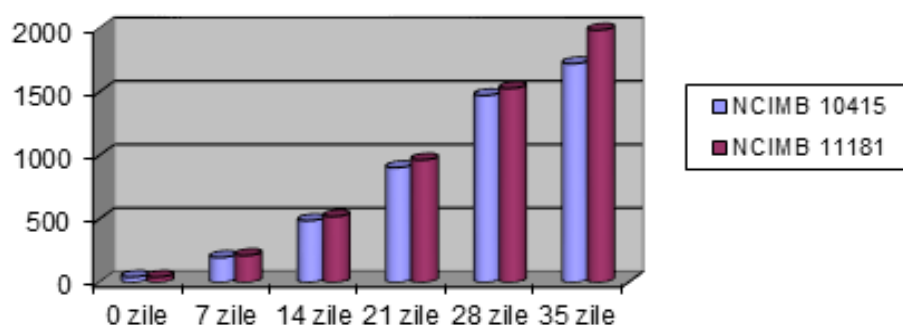


Figure 8 - Trend of increasing bird weight

Table 3 - Bird mortality rate

Strain	7 days	14 days	21 days	28 days	35 days
NCIMB 10415 Period 03-05.2015	0.92%	1.25%	1.69%	2.12%	2.58
NCIMB 11181 Bioenterom Period 05-07.2016	0.41%	0.74%	1.15%	1.45%	1.81
Decreased mortality (%)	-55.43	-40.80	-31.95	-31.60	-29.84

Source: Biometric data obtained during product testing at Avicola Medgidia

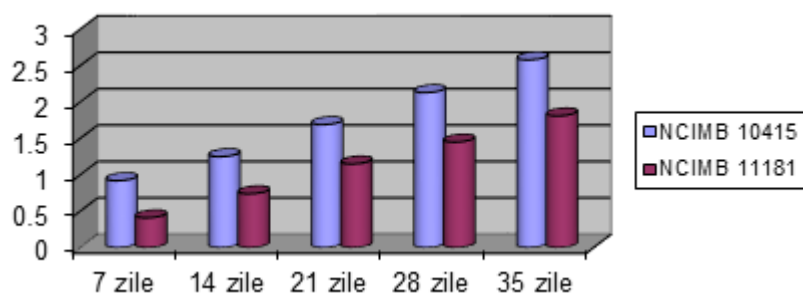


Figure 9 - Trend of decreasing bird mortality

CONCLUSIONS

Following the application of the biofertilizer Rom-Agrobiofertil NP on the tomato crop, there were significant increases both on the plant's physiognomy (fruit increases, plant height, number of ripe fruits per plant, weight of ripe / raw fruits, number of fruits per plant) but especially on increasing the total fruit production per plant.

Following the administration of the probiotic Bioenterom in the Avgola Medgidia on the 230,000 thousands of birds, there was a significant increase in the production increase (meat) as well as a major decrease in the mortality rate of the birds. Thus, following the administration of this product, the farm obtained a production surplus of up to 61 t.

These innovative technologies applied in the agro-zoo-veterinary sector have the role of both greening the environment, ensuring an agri-food production (vegetables, fruits, meat, etc.) safe for the final consumer (man) but above all a safety over the use of these products. obtained in the environment. Biofertilizers have the role of ecologizing the soil, the soil being the basis of agriculture and, implicitly, of the zoo-veterinary sector.

Once applied to the soil surface, the bacteria in their contents have the role of capturing nitrogen from the atmosphere, fixing it in the soil. The other bacteria have the role of ecologizing the soil by destroying the complex compounds identified in the soil texture, solubilizing them so that the plants have all the necessary elements for their growth and development but especially to ensure an ecological production.

The application of probiotics and immunomodulators to farm animals has the role of balancing the animals' immune system, protecting them from possible diseases or ensuring a significant increase in the production increase in poultry and beyond. The fact that probiotics can lower mortality in animals and ensure a substantial increase in weight gain and, by implication of the production itself, is an innovation in the zoo-veterinary sector, which will represent a greater profit for the farmer.

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