

EXPOSURE OF IRRIGATION AND DRINKING WATER TO A MAGNETIC FIELD WITH CONTROLLED POWER AND DIRECTION

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Magnetic treatment affects the quality of irrigation and drinking water. It was shown that treated water contributes to increase in farm yields in both livestock and crop farming, yield being expressed in quantity and quality of the produce and in the specific economic contribution.

1. Introduction

The professional literature contains refs. [1–3] to the physical technology for the pre-treatment of water used for drinking and agricultural irrigation for the purpose of changing its physical characteristics, so as to increase the yield and crop of plant and livestock. This technology is based on the application of an external magnetic field, mechanical or hydraulic energy.

These methods are not applied in practice because of the low efficiency of the installations and the lack of scientific and engineering understanding of the magnetic action. These are the reasons why professional publications are received with much doubt by academics and engineering specialists.

In basic research work carried out at the Technion on the effect of low power magnetic fields on the characteristics of water in laminar flow, it was found that these magnetic fields affect the functioning of inorganic membranes [4]. An improvement in the efficiency of performance and the kinetics of the process was obtained. Based on these findings it was decided to examine the transfer of mass through organic membranes, and when positive preliminary indications were found, a field experiment was planned for the treatment of water for crops and animals, in order to examine the cumulative effect in an agricultural trial.

The research project lasted four years and placed emphasis on the four following aspects [5]:

- a) Type of apparatus: Strength of field, gradient, nature of magnetic circuit, direction of water flow, flow regime, etc.
 - b) Water quality: Type of solutes, composition and quantity, electrical conductivity, pH, temperature.
 - c) Operating conditions: Volume of flow, functioning of open and closed circuit, pressure drop, type of installation, maintenance procedure.
 - d) Costs and engineering suitability for potential users.
- The field experiments included various livestock (cattle, goats, sheep), poultry (hens, geese, turkeys) and produce

(vegetables, fruit, etc.) to determine the effectiveness of pre-treatment, its strength and output, depending on the various parameters. Based on the findings, it was possible to optimize the engineering design, the system and its construction, and to improve the equipment. At present there are already more than 270 such units operating locally on farms.

2. Field tests

2.1. Dairy farm on Kibbutz Gvat

A water pipe supplying a group of milking cows was treated magnetically. A control group of cows received untreated water as usual. The two groups received the same feed and other conditions were identical. They were milked separately. The group on treated water yielded more milk, with the same percentage fat. Lactation period, non-productive days and veterinary conditions were better. Impregnation was better.

2.2. Calves on Kibbutz Gvat

Week-old calves were selectively transferred to controlled growth stables receiving magnetically treated water only, where they stayed till three months old. This group grew 12% faster than the control group. On the same farm, observations were made on the growth of male calves. Three-month old calves were transferred to controlled growing pens where they drank magnetically treated water. They showed increased weight gains. Their meat contained 30 to 40 less kg fat at 10 to 12 months.

2.3. Geese on farm Hayogev

Goslings grow intensively from one-day to two months. Magnetic pre-treatment of their water resulted in improved performance: increased daily weight gains, generally improved health and a greater economic re-

turn to the farmer. The magnetic water system showed a drastic reduction of mineral coating in the pipes and in water containers, clean drinking areas and an absence of blockages in the water cups that normally cause flooding in the cages.

2.4. Sheep farm at Givat Zayad

Sheep are cultivated for milk, meat and wool. All three factors showed a considerable increase in yield; there was a rise in milk output after the flock was sheared in comparison with the usual output.

2.5. Turkeys at Nahalal

Weight increases. Increase in percentage of layers, longer laying period, longer peak laying period, improvement in fertility and percentages.

2.6. Melon on South Arava

An increase in yield, fruit size and sugar content was achieved [6].

A further series of trials is now in progress on goats, pigs, maize (corn), cotton, orchards and industrial tomatoes.

It is possible to say definitely that on most of the experimental sites, in various branches of agriculture, gains were achieved in yield and output which resulted in increased farm income varying between 5% and 20%. The level of return in individual farm depends on three key factors: the type of equipment, the water quality and the mode of operation. In most cases the following facts are clear:

- a) The effect of pre-treatment depends on the kind of water, its contents, temperature, equipment and its location, operational factors, such as water volume, speed of flow, installation, maintenance, etc.
- b) Conditions exist which completely prevent the phenomenon. For example: upper limit of liquid temperature, upper and lower barriers to solutes and the kind of solute, certain flow regimes, presence of other nearby electromagnetic fields, relationship between magnetic field vectors and fluid speed, etc.

In the current research work, basic research was carried out alongside the experimental work. The dependence between the magneto-chemical and the magneto-hydrodynamic effects was shown, which contributed to a broad and fundamental understanding of the subject. As a rule, electro-conductive fluid (such as tap water) flowing at moderate speed through a magnetic field, creates direct electric currents and voltages (which can be calculated and measured). If the basic conditions, known from theory and principles of electromagnetism (magnetohydrodynamics) exist, then the required energy for indicative effect is obtained from the kinetic energy of the water and not from the magnetic circuit.

3. Conclusions

- a) Electro-magnetic treatment of water resulted in a considerable contribution to the various branches of farming. The economics from the cost/benefit aspect are proven. Substantial contributions to other farming activities (fish farming, algae, vegetables and fruit, other livestock) can be expected.
- b) All experiments were carried out under field conditions on a broad scale. Important parameters for the full functioning of the magnetic system were determined.
- c) Electro-magnetic units for water treatment are available commercially.
- d) It appears that the integration of water treatment as discussed above can lead to a breakthrough of maximum benefit to agricultural outputs.
- e) The common features testify to the existence of similar mechanisms and processes with regard to the function of water, common operative factors and similar specific contributions.

References

- [1] K. Syers, *Nz Farmer* 4 (1983) 24.
- [2] S. Gishin, *Gradinarska i Lozarska Nauka* 11 (1974) 61.
- [3] P. Povlov and S. Gyurov, *Fiziologiya na Rastenyata* 9 (1983) 65.
- [4] I.J. Lin and S. Nativ, *Magn. Sep. News* 2 (1988) 137.
- [5] I.J. Lin and J. Yotvat, *Water Irrig. Rev.* 8 (1988) 16.
- [6] I.J. Lin and J. Yotvat, *ibid.* 9 (1989) 4.