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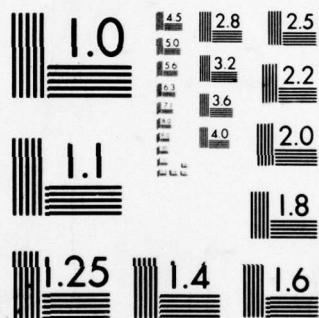
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OF PLANT OUTPUT GROWN WITH
TEXTILE INDUSTRY WASTE WATER IRRIGATION

V.P. Sayapin

April 1978

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NUTRITION VALUE AND FODDER HARMLESSNESS OF PLANT OUTPUT GROWN WITH TEXTILE
INDUSTRY WASTE WATER IRRIGATION

Kupavna PITATEL'NAYA TSENNOST' I KORMOVAYA BEZVREDNOST' RASTENIYEVOLCHESKOY
PRODUKTSII, VYRASHCHENNOY PRI OROSHENII STOCHNYMI VODAMI TEKSTIL'NOGO
PROIZVODSTVA in Russian 1976 pp 1-4

[Article by Candidate of Veterinary Sciences V. P. Sayapin (VNIISV)]

The intensive development of Soviet industry, the chemization of all economic sectors, urbanization, and the construction of big livestock complexes on an industrial basis lead to the formation of huge quantities of waste water which are a serious source of pollution of open reservoirs. Irrigation farming fields (IFF) play an important role among the existing methods for the soil purification of waste water. The use of waste water for farm crop irrigation enables us to resolve simultaneously a number of most important national economic problems related to the purification and additional purification of waste water, and the protection of water sources from pollution. It offers extensive opportunities for raising high and stable crops. Particularly great possibilities develop with the waste water irrigation of fodder and pasture farmland. The long experience gained by Moscow Oblast sovkhoses (Noginskiy, Znamya Oktyabrya, Zarya Kommunistov, and Im. Timiryazev) proves that with waste water irrigation pasture land productivity increases 3-4 times, which makes possible the production of 7,000 to 10,000 fodder units per hectare.

It is believed that feed production on IFF will play a considerable role in the future overall animal husbandry feed balance.

The toxicological-sanitation studies aimed at preventing any possible harmful influence of IFF output on the organisms of warm-blooded animals becomes particularly topical in this connection, since a variety of harmful and toxic substances of no nutritional or food value may find their way from waste water to farm crops (detergents, chromium, organic dyes, and others).

Studies were made by the VNIISV (V. P. Sayapin, L. N. Tsvetnova, I. A. Kas'yanov, T. L. Kosareva, N. I. Matulyavichene, and Yu. I. Tararin) on the influence of long-term feeding with perennial grasses and hay grown

in sectors irrigated with waste waters of the Kupavna fine woolen fabric factory, and of the basic physiological and biochemical indicators of the livestock, their productivity, reproductive functions, and nutritive value of animal husbandry output (meat and milk). The experiments were conducted at the laboratory for veterinary hygiene research and the Noginskiy Sovkhoz, Moscow Oblast. The complex set of biological indicators was studied in the course of chronic experimentation with rabbits, calves and cows, making possible the objective determination of the physiological condition of the organism.

Preliminary organoleptic studies of feeds indicated that perennial grasses and hay grown on IFF were not distinct from control feeds in terms of color and odor. In terms of their chemical composition, the tested feeds were characterized by a considerably higher content of raw protein and fat, and a lower amount of cellulose. This proved their relatively good nutritive value. The degree of eatability of the studied hay, compared with the control, averaged 94.3% ($P > 0.05$). Adding to the ration of rabbits hay from IFF resulted in the following digestibility coefficient of the nutritive substances in the feed mix: protein, 75.9%, compared with 68.1% in the control; fat, respectively, 95.3 and 94.9%; and cellulose, 61.9 and 56.7%.

Throughout the experimental period (2.5 years) the general condition of the experimental animals remained within the range of the physiological norm. All animals adequately reacted to their environment, retained their appetite, and added weight. In the course of the experiment no substantial deviations were noted in the experimental animals in the temperature reaction of the body, and frequently of the pulse beat and respiration.

No changes were noted in the quantitative content of erythrocytes and leukocytes or in the percentile ratio among the individual types of leukocytes and the erythrocyte sedimentation rate between the experimental and control animals.

The experimental data show that adding IFF grown fodder to animal rations has no adverse effect on the protein, carbohydrate, mineral and pigment metabolisms, the level of oxidation-reduction processes in the body, or the activeness of the most important blood ferment systems (Table 1).

Table 1
Some Morphological and Biochemical Indicators in Experimental Rabbits

Группы животных (1)	(2) Исследуемые показатели						
	эритроциты (млн/мм ³) (3)	лейкоциты (тыс/мм ³) (4)	гемоглобин (г/100 г крови) (5)	общий белок (г %) (6)	АЛТ (ед/мл) (7)	билирубин (мг %) (8)	общий глутатион (мг %) (9)
(10) контроль	6.8±0.6	7.4±0.6	71.7±1.6	7.0±0.2	47.8±2.5	0.12±0.01	41.75±1.81
(11) опыт	6.7±0.3	7.9±0.8	75.8±2.6	7.2±0.1	41.8±0.8	0.1±0.01	41.05±1.07

Key:

1. Animal group
2. Studied indicators
3. Erythrocytes (million/mm³)
4. Leukocytes (thousand per mm³)
5. Hemoglobin (Sal units)
6. General protein (grams %)
7. ALT (units/mg)
8. Bilirubin (mg %)
9. General glutathione (mg %)
10. Control
11. Experimental

The use of experimental rations had no harmful effect on the genetic apparatus of the animals and the immunological reactivity (complementary, bacteriocide, lysozymic activeness of the blood serum and the manufacturing of specific agglutinins). Morphological studies showed no changes in the macro- and micro-morphological structure of the internal organs of the experimental animals.

The study of cow milk productivity indicated that the average milking per forage cow over 300 days of lactation in the experimental group was 3,230 kilograms of milk, compared with only 3056 kilograms in the control group. The organoleptic study of the milk of the experimental cows was totally identical to the milk of the control cows in terms of color, taste, and odor. Throughout the experimental period (2,5 years) no negative changes were noted in the chemical composition of the milk of the experimental cows (Table 2).

Table 2

Cow Milk Chemical Composition

Группы животных (1)	(2) Исследуемые показатели (г %)				
	кислотность (°T) (3)	плотность (4)	общий азот (5)	жир (6)	сахар (7)
(8) контроль	18,4±0,2	1,03±0,001	3,2±0,1	3,0±0,2	4,3±0,2
(9) опыт	16,6±0,8	1,03±0,001	3,9±0,03	3,5±0,2	4,7±0,1

Key:

- | | |
|---------------------------------|-----------------|
| 1. Animal group | 6. Fat |
| 2. Studied indicators (grams %) | 7. Sugar |
| 3. Acidity (°T) | 8. Control |
| 4. Density | 9. Experimental |
| 5. General nitrogen | |

In terms of chemical composition the meat of the experimental rabbits as well showed no major differences compared with the control group (Table 3).

Table 3

Группы животных (1)	(2) Исследуемые показатели (г % сухого вещества)						
	белковый азот (3)	жир (4)	зола (5)	Na	K	P	Ca
(6) контроль	11,71±0,20	5,78±0,38	4,17±0,07	0,14±0,01	1,20±0,10	0,65±0,07	0,47±0,05
(7) опыт	11,89±0,30	6,69±0,96	4,34±0,21	0,19±0,05	1,14±0,04	0,73±0,09	0,50±0,04

Key:

- | | |
|---|-----------------|
| 1. Animal group | 4. Fat |
| 2. Studied indicators (grams % of dry matter) | 5. Ash |
| 3. Protein nitrogen | 6. Control |
| | 7. Experimental |

Therefore, the conducted studies prove that the extensive use of perennial grasses and hay grown on sectors irrigated with the waste water of the Kupavna fine woolen fabrics factory in feeding a variety of animals had no adverse effect on the health conditions of the animals, their productivity, nutritive value of animal husbandry output, animal reproductive function, and quality of offspring.

The study of cow milk productivity indicated that the average milk yield of cows in the experimental group was 1,200 kg, compared with 1,000 kg in the control group. The productivity of the milk of the experimental cows was 10% higher than that of the control cows. The study of the milk of the experimental cows in terms of solids, lactose, and protein, showed that the experimental group (2) had a higher content of solids and protein than the control group (1). The nutritive value of the milk of the experimental group was 10% higher than that of the control group.

Table 1

The Milk Chemical Composition

Group	Chemical composition, %			
	Protein	Lactose	Solids	Water
(1) Control	10.0	5.0	15.0	85.0
(2) Experimental	11.0	5.5	16.5	83.5

1. Control group
2. Experimental group
3. Control group
4. Experimental group
5. Control group
6. Experimental group
7. Control group
8. Experimental group

The study of sheep productivity indicated that the average milk yield of sheep in the experimental group was 1,000 kg, compared with 800 kg in the control group. The productivity of the milk of the experimental sheep was 25% higher than that of the control sheep. The study of the milk of the experimental sheep in terms of solids, lactose, and protein, showed that the experimental group (2) had a higher content of solids and protein than the control group (1). The nutritive value of the milk of the experimental group was 25% higher than that of the control group.

Table 2

Group	Chemical composition, %			
	Protein	Lactose	Solids	Water
(1) Control	10.0	5.0	15.0	85.0
(2) Experimental	12.5	6.25	18.75	81.25

1. Control group
2. Experimental group
3. Control group
4. Experimental group
5. Control group
6. Experimental group
7. Control group
8. Experimental group