

Effect of Manure Treatment Methods in Cowsheds on Udder Health and Milk Quality

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One of the major conditions for maintaining udder health in pack barns is keeping the pack as dry as possible. Use of bedding materials is both costly and requires constant manure removal from the barn (environmental protection).

Purpose of the study: To evaluate and compare two pack treatment methods and their effect on udder health.

Course of the study: The observation was conducted over the course of one year in a commercial dairy farm located in the Shefelah region [Judean lowlands], where the cows are milked three times a day with an average production of 39 liters/cow/day.

Treatments: In one barn, the pack was treated by harrowing the surface to a depth of up to 5 cm; in the second barn – deep cultivation was applied 30-50 cm (figure no 1). Neither method involved the addition of bedding material throughout the observation period.

Fig.no.1.- Harrowing the surface (0-5 cm) and Deep cultivation (30-50 cm)



Cows were designated to two similar groups (73-76 cows in each group), from the second calving and up according to milk yields, somatic cell count, days from calving. Both groups were kept in barns of a similar structure and area per cow (22 sq.m./cow). Both packs were treated daily throughout the months of the observation.

The effect of the various treatment methods were monitored by culturing of the pack for pathogens, dry matter content and the incidence of udder infections. Six fixed sampling points were determined and marked, from which the manure (100 g) was sampled once a month. The samples (n=144) were taken proximate to the monthly DHI check, and were transported in a refrigerated vehicle to the Udder Health Lab in Caesarea for performing the following tests: total cell count, differential cell count (E. coli and Streptococci) and the pH level of the soil sample. At the same time, soil temperature was measured (at a depth of 10-15 cm) as well as air temperature and relative humidity on the testing day. The percentages of dry matter in the

manure samples were tested at the Vulcani Institute lab. The cleanliness of the cows was monitored in both groups on farm for evaluating cleanliness. Ten standing cows in each group were inspected once a month for cleanliness of udder, legs, tail and body sides. Values ranged from 1-4, with 1 being very clean and 4 being very dirty (the evaluations were according to a cleanliness/dirtiness ratio in each area of the cow's body inspected). Also tested was the incidence of clinical and sub-clinical udder infections (according to the somatic cell count at the time of the monthly DHI), pathogens and the severity of the clinical udder infections.



RESULTS:

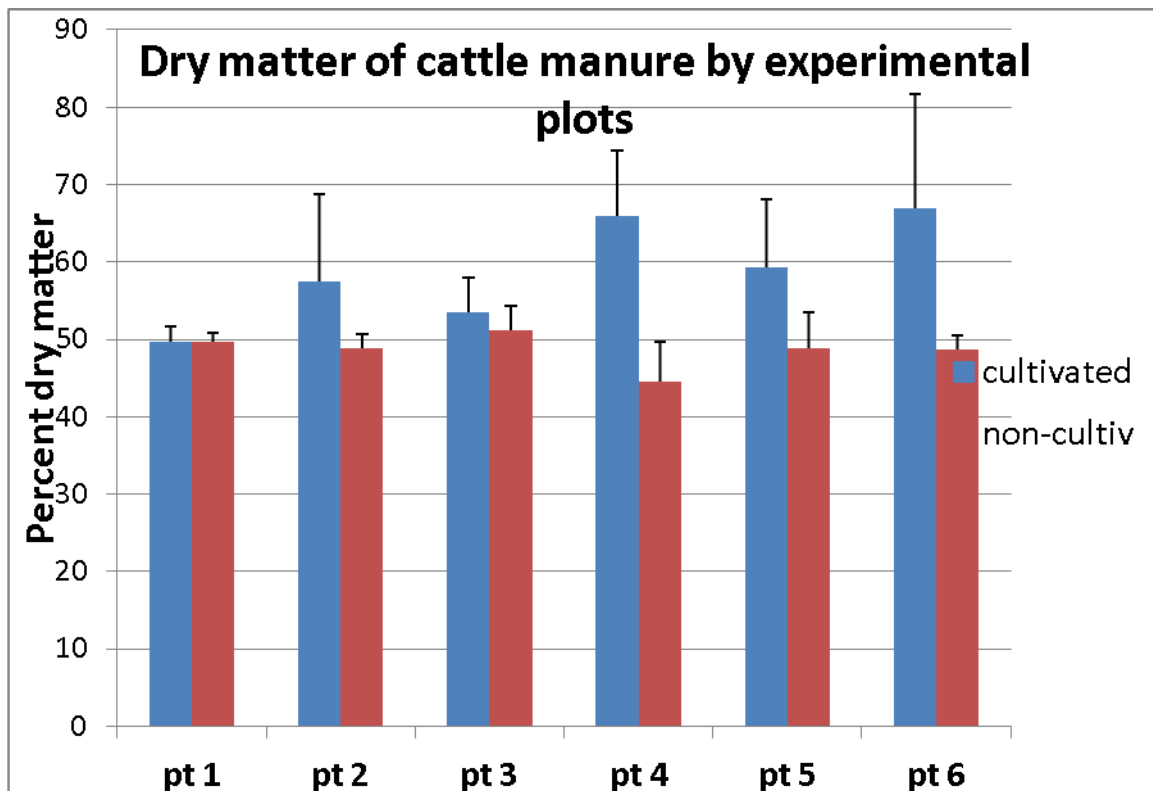
Microbiological composition of the manure: 144 manure tests were taken for total bacteria and differential bacteria counts from all of determined sampling points in the barn during all the trial months. A decrease was found in the Total Count ($p < 0.04$), *Coliform* counts ($p < 0.004$) and *Streptococcus* ($p < 0.0001$) in the "deep cultivation group" as opposed to the "harrowing group".

Soil temperature and pH level: Internal manure temperature was tested when taking the monthly manure sample. It was found that the mean temperature in the "deep cultivation group" was higher throughout the sampling months (32.9 versus 26.2 in the "harrowing group"). The temperature never reached 60°C – the right temperature for creating proper compost. It was found that the deep cultivation process raises the temperature as opposed to the harrowing group. The air temperature under the barn roof, sunlight or relative humidity was not found to have any effect on the manure temperature. Acidity (pH) in the "cultivation group" was found to be more basic than in the "harrowing group" at 9.265 versus 9.089 ($p > 0.016$).

Percentage of dry mater in soil: The test was conducted to compare between the sampling points in each barn among themselves and between the two barns. Despite the major variance between the sampling points in the same cowshed, significant differences were found in favor of the sampling points found in the deep cultivation barn and in the total dry mater in both barns (59.8% versus 47%) throughout the year ($p < 0.001$). The percentage of dry mater in the two groups at the beginning of the trial started from a level of 47-48%. A steady increase of up to over 60% was found in the content of dry mater in the deep cultivation group. At the same time, the dry mater in the control group did not change in all the months remaining at 40-47%.

Tab.1-Dry matter of cattle manure (%) by experimental plots

Month	Cult	non-cult	std cult	std non-cult
0	46.8	48.9	4.28	2.37
1	64.4	48.4	10.46	2.43
2	58.9	48.7	11.4	1.13
3	60.3	48.3	10.43	3.76
4	63.4	48.7	6.68	7.09
5	63.8	47.9	14.02	3.26
6	59.4	43.8	4.57	2.55
7	53.8	42.3	3.44	3.11
average	58.8	47.1		



Cleanliness of the cows: The cows in the "cultivation group" were found to be cleaner in comparison in the different areas inspected on the cow's body and on average in the general cleanliness index of both groups (1.66 versus 2.24, respectively).

Somatic Cell Counts – sub-clinical udder infections: DHI somatic cell count was tested in both groups to quantify the results into one common denominator; the percentage of cows found without udder infections was tested based on their somatic cell count level (percentage of cows with results below 200,000 SCC/ml in both groups). It was found that on average, the percentage of udder-healthy cows in the "cultivation group" was higher in most of the months compared to the "harrowing group" (70.6% versus 65.4%).

Clinical udder infections: Borderline significant differences were found ($p>0.067$) in the incidence of clinical infections. It was found that the most common pathogen in both groups was *e. coli* (70%). Other pathogens were cultured in the "harrowing group", such as *Streptococcus dysglacia* and *A.pyogenes*. These factors impacted the severity of the infection and recoverability in the control group.

SUMMARY:

This study found for the first time, in a controlled manner and based on lab tests, that the deep cultivation method creates drier cattle pen conditions, higher cattle pen temperature and a basic environment which together affect the concentration of bacteria in the cattle pen. The main effect on udder health that was found is a decrease in the percentages of sub-clinical udder infections. It is noteworthy that applying this method requires suitable environmental conditions - more than 20 sq.m/cow - equipment and technical capabilities (proper deep cultivation) and, above all, the environmental treatment must be carried out in a fixed daily routine in order to obtain the optimal effect, as described in this study.

The study was funded by the Israel Dairy Board's research fund.