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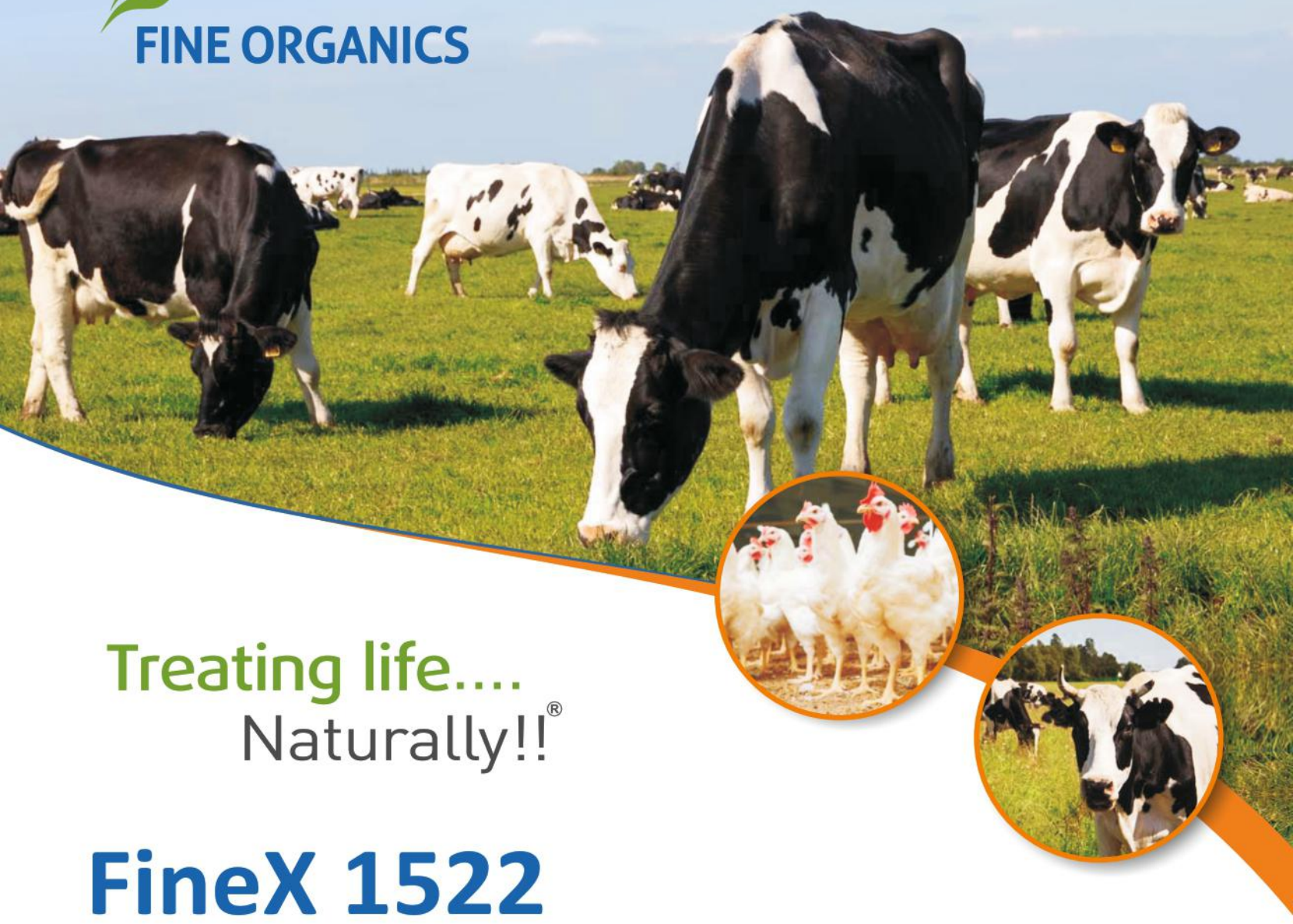

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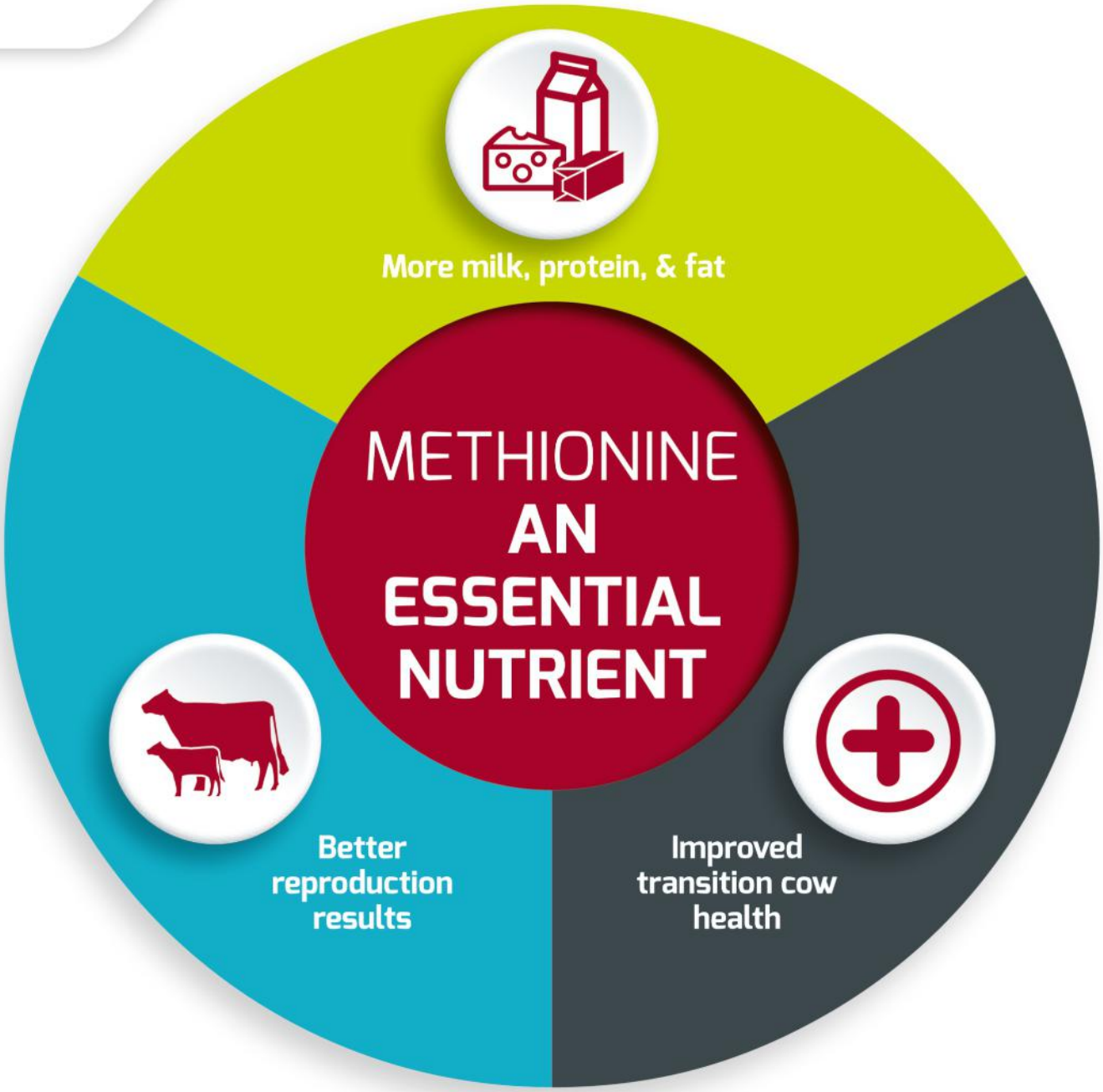

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From the Editor's Desk

Supreme Court Asks Delhi's Neighboring States to Stop Stubble Burning

The Supreme Court directed the state governments of Punjab, Haryana, Uttar Pradesh, Rajasthan, and Delhi to ensure the immediate cessation of stubble burning as a critical measure to safeguard the lives and health of people. Justice stated that pollution should not be treated as a political game, where one state shifts blame to another depending on the ruling political dispensation. This pollution amounts to the murder of people's health. Children in Delhi are suffering from health issues due to this pollution. As a long-term measure, the Punjab government will incentivize farmers to switch from paddy cultivation to traditional crops like millet by offering them the minimum support price (MSP). Punjab has been one of the significant contributors to the large-scale burning of paddy stubble. The state is also witnessing a drastic decline in the water table due to extensive paddy cultivation covering 31 lakh acres. Satellites detected 2,914 residue-burning events in the six studied states, including 2,060 in Punjab, 65 in Haryana, 87 in Uttar Pradesh, zero in Delhi, 47 in Rajasthan, and 655 in Madhya Pradesh, totaling 29,641 cases between September 15 and November 6. An official analyzing the stubble burning data received from the Indian Council of Agricultural Research (ICAR) said that if the air quality index in Delhi remains the same despite a reduction in stubble burning cases by over 35 percent in Punjab and Haryana, then the problem seems to lie elsewhere. While there should be no stubble burning at all, it's unfair to blame the farmers all the time. Farmer leaders argue that farm fires can be nearly eliminated if the necessary machines are provided to process crop residue. However, officials find it challenging to provide machines to all farmers, considering that the need becomes redundant after the paddy harvesting season. Additionally, officials mentioned providing over Rs 90 crore to farmers in Haryana this year, as 940 lakh acres have been registered to receive incentives under a government scheme. The Haryana government offers an incentive of Rs 1,000 per acre for refraining from stubble burning. However, farmer leaders argue that this amount is too low, as it costs Rs 5,000 per acre to dispose of crop residue by making bales.

The procurement price of milk with 3.5 percent fat and 8.5 percent SNF in Maharashtra has dropped from Rs 35 per litre to the present Rs 28-29 per litre. Except for cooperative dairies, private players have begun adjusting prices, leading to unrest among dairy farmers. Constant price corrections in milk procurement by dairies have made Diwali a bitter experience for dairy farmers. As dairies struggle with increased production and low demand, they have cautioned about further price reductions if urgent measures are not taken by the state or Centre. Cooperative dairies procure 30 percent, while private dairies procure 70 percent of milk. Demand peaks during summer when production is low, and in winter, when animal milk production increases, demand dips. Dairies convert excess milk into SMP and white butter, which they use when demand surges, especially during summer. Presently, the country holds a reserve of around 2.80 lakh tonnes of SMP. However, exports are not feasible due to international prices hovering around Rs 220-230 per kg compared to the production cost of Rs 250-260 per kg, unless supported by government subsidies. The Dairy Farmers and Processors Welfare Association has urged government intervention, either through direct subsidies to farmers or government procurement.

The Karnataka Milk Federation has proposed a price hike for Nandini milk, suggesting an increase in milk and curd prices starting from the New Year. Federations are facing losses, necessitating a revision in milk prices. The rate of Nandini milk is lower compared to milk prices in other states, particularly neighboring states where it ranges from Rs 48 to 51 per litre. The price of KMF's Nandini milk was raised by □3 per litre on September 1. However, Amul has increased its prices by 12 per litre within ten months, from March 2022 to February 2023. Milk producers' unions have submitted a report detailing the burden caused by increased production costs.

In Andhra Pradesh, all dairy farmers are favoring Amul, which is in partnership with the AP government under the JaganannaPaalaVelluva Programme. Amul offers the highest prices for milk to farmers and refutes allegations made by opposition leaders regarding neglect faced by milk farmers. So far, there have been 3.73 lakh women milk farmers in the state. Amul collects an average of 2.73 lakh litres of milk per day from 4,113 women cooperative societies.

Editor

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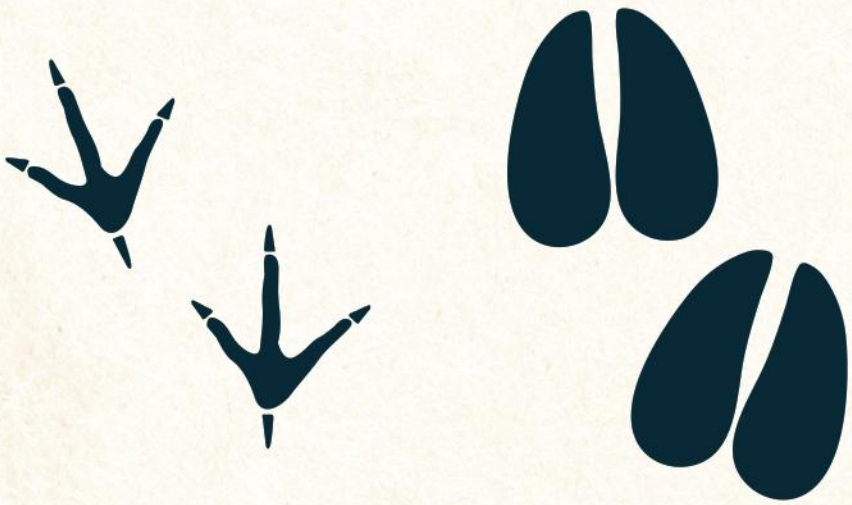

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ਗੁਰੂ ਅੰਗਦ ਦੇਵ ਵੈਟਨਰੀ ਅਤੇ ਐਨੀਮਲ ਸਾਇੰਸਸ ਯੂਨਿਵਰਸਿਟੀ, ਲੁਧਿਆਣਾ

ਪੰਜਾਬ ਵਿੱਚ ਲਗਭਗ 5.5 ਲੱਖ ਹੈਕਟੇਅਰ ਤੇ ਹਰਾ ਚਾਰਾ ਬੀਜਿਆ ਜਾਂਦਾ ਹੈ। 40 ਲੱਖ ਮੱਝਾਂ ਅਤੇ 25 ਲੱਖ ਗਾਈਆਂ ਲਈ ਔਸਤਨ 28-30 ਕਿਲੋ ਰੋਜਾਨਾ ਪ੍ਰਤੀ ਜਾਨਵਰ ਹਿੱਸੇ ਆਉਂਦਾ ਹੈ। ਇਸੇ ਲਈ ਸਾਲ ਵਿੱਚ ਦੋ ਵਾਰੀ ਮਈ-ਜੂਨ ਅਤੇ ਅਕਤੂਬਰ-ਨੰਵਬਰ ਵਿੱਚ ਹਰੇ ਚਾਰੇ ਦੀ ਥੁੜ ਰਹਿੰਦੀ ਹੈ।ਪਰਾਲੀ ਦੀ ਵਰਤੋਂ ਹਰੇ ਚਾਰੇ ਦੀ ਘਾਟ'ਚ ਭਵਿਖ ਲਈ ਕਈ ਖਰਚਿਆਂ ਨੂੰ ਘਟਾ ਸਕਦੀ ਹੈ। ਪਰ ਇੱਕ ਲਵੇਰੇ ਦੀ ਖਾਣ ਦੀ ਸਮਰਥਾ ਇਸ ਗਲ਼ ਤੇ ਨਿਰਭਰ ਕਰਦੀ ਹੈ ਕਿ ਉਹ ਪਰਾਲੀ ਕਿੰਨੀ ਕੁ ਹਜਮ ਕਰ ਸਕਦਾ ਹੈ। ਕਿਸੇ ਵੀ ਚਾਰੇ ਦੀ ਖ਼ੁਰਾਕੀ ਗੁਣਵੰਤਾ ਉਸ ਵਿਚਲੇ ਤੱਤਾਂ ਅਤੇ ਰੇਸ਼ੇ ਤੇ ਨਿਰਭਰ ਕਰਦੀ ਹੈ। ਪਰਾਲੀ ਵਿੱਚ ਲਗਭਗ 40% ਸੈਲੁਲੋਜ਼ (Cellulose), 18% ਹੈਮੀਸੈਲੁਲੋਜ਼ (Hemicellulose) ਅਤੇ 5.5% ਲਿਗਨਿਨ (Lignin) ਹੁੰਦਾ ਹੈ। ਇਸ ਲਿਗਨਿਨ ਸਦਕਾ ਹੀ ਝੋਨੇ ਦੇ ਪੋਦੇ ਨੂੰ ਖ਼ੁਰਾਕੀ ਤੱਤ ਮਿਲਦੇ ਹਨ, ਪਾਣੀ ਮਿਲਦਾ ਹੈ, ਬੂਟਾ ਦਾਣਿਆਂ ਦਾ ਭਾਰ ਸੰਭਾਲ ਸਕਦਾ ਹੈ।ਇਹ ਲਿਗਨਿਨ ਇਕ ਪਸ਼ੂ ਹਜਮ ਨਹੀ ਕਰ ਸਕਦਾ। ਪਰਾਲੀ ਵਿੱਚ 15% ਫੀਸਦੀ ਦੇ ਲਗਭਗ ਰੇਤਾ ਹੁੰਦਾ ਹੈ ਜਿਸ ਸਦਕਾ ਪਸ਼ੂ ਇਸਨੂੰ ਜਿਆਦਾ ਖਾਣ ਤੋਂ ਗੁਰੇਜ ਕਰਦੇ ਹਨ। ਆਮ ਹਾਲਾਤਾਂ ਵਿੱਚ ਇੱਕ ਚੰਗੀ ਲਵੇਰੀ (ਮੱਝ 10 ਲਿੱਟਰ ਤੇ ਗਾਂ 15 ਲਿੱਟਰ ਦੁੱਧ ਪ੍ਰਤੀ ਦਿਨ) 30 ਕਿਲੋ ਹਰਾ ਚਾਰਾ, 1-2 ਕਿਲੋ ਤੂੜੀ/ਪਰਾਲੀ ਅਤੇ 5-6 ਕਿਲੋ ਫੀਡ ਖਾ ਸਕਦੀਆਂ ਹਨ। ਪਰ ਹਰਾ ਤਾਂ ਹਰ ਸਾਲ ਘੱਟ ਰਿਹਾ ਹੈ (ਝੋਨੇ/ਕਣਕ ਨੂੰ ਪਹਿਲ; ਸੁੱਖ ਨਾਲ ਹੁਣ ਤਾਂ ਸਰਕਾਰੀ ਭਾਅ ਵੀ ਵੱਧ ਗਿਆ), ਇਸ ਕਰਕੇ ਫੀਡ ਵੱਧ ਖੁਆਣੀ ਚਾਹੀਦੀ ਹੈ, ਪਰ ਮੰਹਿਗੀ ਤੇ ਮਿਆਰੀ ਨਾ ਮਿਲਣ ਕਰਕੇ ਘਰੇਲੂ ਟੋਟਕੇ ਵਧੇਰੇ ਚਲਦੇ ਹਨ। ਬੇਹਿਸਾਬ ਖੱਲਾਂ ਦੀ ਵਰਤੋਂ ਦੇ ਨਿਰੰਤਰ ਹੱਥਕੰਡੇ ਅਪਣਾਏ ਜਾ ਰਹੇ ਹਨ।

ਇਸ ਸਾਲ ਪੰਜਾਬ ਵਿੱਚ ਲਗਭਗ 31.9 ਲੱਖ ਹੈਕਟੇਅਰ (5.8 ਲੱਖ ਹੈਕਟੇਅਰ ਬਾਸਮਤੀ) ਤੇ ਝੋਨਾ ਬੀਜਿਆ ਗਿਆ ਤੇ ਜਿਸਦਾ ਉਤਪਾਦ 208 ਲੱਖ ਟਨ ਹੋਣ ਦਾ ਅਨੁਮਾਨ ਲਗਾਇਆ ਜਾ ਰਿਹਾ ਹੈ। ਇਸਦੀ ਔਸਤਨ ਪੈਦਾਵਾਰ 6600 ਕਿਲੋ ਪ੍ਰਤੀ ਹੈਕਟੇਅਰ ਆਉਂਦੀ ਹੈ। ਝੋਨੇ ਦੀ ਪੈਦਾਵਾਰ ਦੇ ਨਾਲ ਨਾਲ ਕਈ ਸਹਿ-ਉਤਪਾਦ ਵੀ ਪੈਦਾ ਹੁੰਦੇ ਹਨ, ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਪਰਾਲੀ ਇਕ ਹੈ। ਇਕ ਅਨੁਮਾਨ ਮੁਤਾਬਿਕ ਪੰਜਾਬ ਵਿੱਚ 210-220 ਲੱਖ ਟਨ ਪਰਾਲੀ ਬਣਦੀ ਹੈ, ਜਿਸ ਵਿੱਚੋਂ 75-80 ਫੀਸਦੀ ਪਰਾਲੀ ਨੂੰ ਖੇਤਾਂ ਵਿੱਚ ਹੀ ਜਲਾ ਦਿੱਤਾ ਜਾਂਦਾ ਹੈ। ਪਰਾਲੀ ਨੂੰ ਜਲਾਉਣਾਂ ਜਿਥੇ ਮੱਨੁਖੀ ਸਿਹਤ ਲਈ ਖਤਰਨਾਕ ਹੈ, ਉਥੇ ਅਜਿਹਾ ਕਰਨ ਨਾਲ ਵਾਤਾਵਰਣ ਪ੍ਰਦੂਸ਼ਤ ਹੁੰਦਾ ਹੈ। ਇਸ ਤੋਂ ਇਲਾਵਾ, ਪਰਾਲੀ ਨੂੰ ਸਾੜਨ ਨਾਲ ਜਮੀਨ ਦੀ ਉਪਰਲੀ ਪਰਤ ਵਿੱਚੋਂ ਨਾਈਟ੍ਰੋਜਨ, ਫਾਸਫੋਰਸ, ਸਲਫਰ ਅਤੇ ਪੋਟਾਸ਼ੀਅਮ ਵਰਗੇ ਤੱਤਾਂ ਦੀ ਕਮੀ ਹੋ ਜਾਂਦੀ ਹੈ, ਜਿਸ ਨਾਲ ਉਪਜਾਊ ਸ਼ਕਤੀ ਘੱਟਦੀ ਹੈ, ਨਤੀਜਾ ਜਮੀਨ ਭਵਿੱਖ ਵਿੱਚ ਖੇਤੀਬਾੜੀ ਲਈ ਸਹੀ ਨਹੀ ਰਹਿੰਦੀ।

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ਪਰਾਲੀ ਵਿੱਚਲੇ ਖ਼ੁਰਾਕੀ ਤੱਤਾਂ ਦੀ ਮਾਤਰਾ ਵੀ ਕਈ ਗਲ਼ਾਂ ਤੇ ਨਿਰਭਰ ਕਰਦੀ ਹੈ; ਜਿਵੇਂ ਕਿ ਕਟਾਈ ਦਾ ਸਮਾਂ (ਦੇਰੀ ਨਾਲ ਕੱਟੇ ਝੋਨੇ ਵਿੱਚ ਲਿਗਨਿਨ ਦੀ ਮਾਤਰਾ ਜ਼ਿਆਦਾ ਹੰਦੀ ਹੈ), ਖਾਦਾਂ ਦੀ ਵਰਤੋਂ (ਵੱਧ ਯੂਰੀਆ ਪਾਣ ਨਾਲ ਵੀ ਲਿਗਨਿਨ ਵੱਧਦਾ ਹੈ), ਮਿੱਟੀ ਦੀ ਉਪਜਾਊ ਸ਼ਕਤੀ, ਪੱਤੇ ਦੀ ਲੰਬਾਈ ਅਤੇ ਚੁੜਾਈ ਦਾ ਅਨੁਪਾਤ, ਕੁਤਰੀ ਪਰਾਲੀ ਦੀ ਲੰਬਾਈ, ਝੋਨੇ ਦੀ ਕਿਸਮ ਨੂੰ ਲਗਣ ਵਾਲੀਆਂ ਬਿਮਾਰੀਆਂ, ਕਟਾਈ ਤੋਂ ਸਾਭੰਣ ਤਕ ਦਾ ਸਮਾਂ, ਪੋਦੇ ਦੀ ਲੰਬਾਈ ਅਤੇ ਮੌਸਮ ਦੇ ਹਾਲਾਤ ਆਦਿ। ਪਿਛਲੇ ਦਹਾਕੇ ਵਿੱਚ ਪਰਾਲੀ ਨੂੰ ਪਸ਼ੂਆਂ ਦੀ ਖ਼ੁਰਾਕ ਦਾ ਅਹਿਮ ਹਿਸਾ ਬਣਾਉਣ ਲਈ ਕਈ ਯਤਨ ਕੀਤੇ ਗਏ ਜੋ ਕਿ ਸੰਖੇਪ ਵਿੱਚ ਵਰਨਣ ਕੀਤੇ ਜਾ ਰਹੇ ਹਨ:

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1. **ਪਾਣੀ ਨਾਲ ਭਿਉਂਣਾ:** ਜੇ ਕਰ ਪਰਾਲੀ ਨੂੰ ਰਾਤ ਭਰ ਪਾਣੀ'ਚ ਭਿਉਂ ਦਿਤਾ ਜਾਏ, ਤਾਂ ਇਸ ਵਿੱਚਲੇ ਰੇਸ਼ੇ ਫੁਲ ਜਾਂਦੇ ਹਨ, ਮੁਲਾਇਮ ਹੋ ਜਾਂਦੇ ਹਨ।ਇਸ ਵਿੱਚਲੇ ਔਗਜ਼ਲੇਟ ਜਹਿਰ ਦੀ ਮਾਤਰਾ ਘੱਟਦੀ ਹੈ। ਲਿਗਨਿਨ ਦੀ ਪੱਕੜ ਢਿਲੀ ਹੋ ਜਾਂਦੀ ਹੈ ਤੇ ਉਝਰੀ (ਮਇਨ) ਦੇ ਕਿਟਾਣੂ ਇਸ ਪਰਾਲੀ ਨੂੰ ਆਸਾਨੀ ਨਾਲ ਹਜਮ ਕਰ ਸਕਦੇ ਹਨ। ਇਹ ਦੇਖਣ ਵਿੱਚ ਆਇਆ ਹੈ ਕਿ ਪਸ਼ੂ ਪਰਾਲੀ ਵੱਧ ਖਾਂਦੇ ਹਨ ਤੇ ਪਰਾਲੀ ਨੂੰ ਹਜਮ ਕਰਨ ਦੀ ਸ਼ਕਤੀ 10% ਫੀਸਦੀ ਤਕ ਵੱਧ ਜਾਂਦੀ ਹੈ। ਅੱਧਾ ਕਿਲੋ ਤੋਂ ਇੱਕ ਕਿਲੋ ਦੁੱਧ ਵੀ ਰੋਜਾਨਾ ਵੱਧਦਾ ਹੈ। ਪਰ ਪਾਣੀ ਦੀ ਕੁਆਲਿਟੀ ਯਕੀਨੀ ਬਣਾਉਣੀ ਪੈਂਦੀ ਹੈ। ਪਾਣੀ ਦੀ ਕੁੰਡ/ਹੋਦੀ ਆਦਿ ਨੂੰ ਚੰਗੀ ਤਰ੍ਹਾਂ ਸਾਫ ਰਖਣਾ ਪੈਂਦਾ ਹੈ ਨਹੀਂ ਤਾਂ ਪਰਾਲੀ ਵਿੱਚਲਾ ਰੇਤਾ ਹੀ ਇੱਕਠਾ ਹੋ ਜਾਂਦਾ ਹੈ।

2. **ਕੁੱਤਰਾ ਕਰਨਾ:** ਜੇ ਕਰ ਮਸ਼ੀਨਾ ਰਾਹੀਂ ਪਰਾਲੀ ਦਾ ਬਰੀਕ ਕੁੱਤਰਾ ਕਰ ਲਿਆ ਜਾਏ (1-2 ਇੰਚ) ਤਾਂ ਦੇਖਣ'ਚ ਆਇਆ ਹੈ ਕਿ ਪਰਾਲੀ ਵਿੱਚਲੇ ਰੇਸ਼ੇ ਦੇ ਵੀ ਬਰੀਕ ਟੁਕੜੇ ਹੋ ਜਾਂਦੇ ਹਨ।ਕੁਤਰਾ ਕਰਨ ਸਦਕਾ ਇਸ ਵਿੱਚਲੇ ਰੇਤੇ (ਸ਼ਲਿਚਿਓ) ਦੀ ਮਿਕਦਾਰ ਘੱਟਦੀ ਹੈ। ਇੱਸ ਵਿੱਚਲੇ ਸੈਲੁਲੋਜ਼ ਅਤੇ ਹੈਮੀਸੈਲੁਲੋਜ਼ ਬਹੁਤ ਹੱਦ ਤਕ ਲਿਗਨਿਨ ਤੋਂ ਅੱਲਗ ਹੋ ਜਾਂਦੇ ਹਨ ਤੇ ਪਰਾਲੀ ਦੀ ਪਚਣ ਸ਼ਕਤੀ ਵੱਧ ਜਾਂਦੀ ਹੈ। ਇਸ ਵਿੱਧੀ ਰਾਹੀਂ ਪਸ਼ੂ ਪਰਾਲੀ ਨੂੰ ਅੰਜਾਈ ਵੀ ਨਹੀਂ ਕਰਦੇ ਅੱਤੇ ਚੁਣ ਚੁਣ ਕੇ ਵੀ ਨਹੀਂ ਖਾਂਦੇ ਤੇ ਲਿਤਾੜਦੇ ਵੀ ਨਹੀਂ।

3. **ਪਰਾਲੀ ਦੀਆਂ ਗੋਲੀਆਂ ਵਾਲੀ ਫੀਡ:** ਅੱਜ ਕਲ ਪਸ਼ੂਆਂ ਦੀ ਖ਼ੁਰਾਕ'ਚ ਵਧੇਰੇ ਪਰਾਲੀ ਦੀ ਵਰਤੋਂ ਕਰਨ ਦੇ ਯਤਨਾਂ ਸੱਦਕਾ, ਕੁੱਤਰੀ/ਬਰੀਕ ਪਰਾਲੀ ਨੂੰ ਕੁੱਝ ਹੋਰ ਜਿਣਸਾਂ (ਸ਼ੀਰਾ, ਪਾਲਿਸ਼, ਚੌਕਰ ਅਦਿ) ਨਾਲ ਮਿਲਾ ਕੇ, ਮਸ਼ੀਨਾਂ ਰਾਹੀਂ ਗੋਲੀਆਂ ਦੇ ਰੂਪ'ਚ ਬਣਾਉਣ ਦੇ ਤਜਰਬੇ ਕੀਤੇ ਜਾ ਰਹੇ ਹਨ। ਗੋਲੀਆਂ ਵਾਲੀ ਪਰਾਲੀ ਦੀ ਫੀਡ ਇਕ ਆਕਾਰ ਦੀ ਬਣਦੀ ਹੈ, ਧੂੜੇ ਅਦਿ ਤੋਂ ਬਚਾਅ ਰਹਿੰਦਾ ਹੈ, ਸਾਂਭ ਸੰਭਾਲ ਸੋਖੀ ਹੰਦੀ ਹੈ।ਇਸ ਕਿਸਮ ਦੀ ਪਰਾਲੀ ਖਾ ਕਿ ਮੀਥੇਨ ਗੈਸ ਦੇ ਉਤਪਾਦ ਵਿੱਚ ਕਮੀ ਹੁੰਦੀ ਹੈ ਤੇ ਦੁੱਧ ਵਿੱਚ ਵੀ ਵਾਧਾ ਦੇਖਿਆ ਗਿਆ ਹੈ। ਪਰ ਇਸ ਕਿਸਮ ਦੀ ਪਰਾਲੀ ਦੀ ਫੀਡ ਦੇ ਨਤੀਜੇ ਉਸ ਵਿੱਚਲੇ ਪਰਾਲੀ ਦੇ ਅਨੁਪਾਤ ਤੇ ਨਿਰਭਰ ਕਰਦੇ ਹਨ। ਅਕਸਰ ਦੇਖਿਆ ਗਿਆ ਹੈ ਕਿ ਪਰਾਲੀ ਦੀ ਗੋਲੀ ਵਿੱਚ 80-85% ਪਰਾਲੀ ਹੀ ਹੁੰਦੀ ਹੈ, ਇਸ ਕਰਕੇ ਅਕਸਰ ਪਸ਼ੂ ਪੇਟਭਰ ਨਹੀਂ ਖਾਂਦੇ। ਇਸ ਕਿਸਮ ਦੀ ਗੋਲੀ ਵਾਲੀ ਪਰਾਲੀ ਜਿਆਦਾ ਤਰ ਖਾੜੀ ਦੇ ਦੇਸ਼ਾ ਨੂੰ ਨਿਰਯਾਤ ਕਰਨ ਦੇ ਯਤਨ ਹੋ ਰਹੇ ਹਨ, ਜਿਥੇ ਹਰਾ ਚਾਰਾ ਨਾ ਦੇ ਬਰਾਬਰ ਹੈ ਤੇ ਬਹੁਤੇ ਪਸ਼ੂ ਮੀਟ (ਭਇਣਡ) ਲਈ ਪਾਲੇ ਜਾਂਦੇ ਹਨ।

4. **ਭਾਫ ਪ੍ਰਣਾਲੀ:** ਪਰਾਲੀ ਨੂੰ ਪਸ਼ੂਆਂ ਲਈ ਵੱਧ ਤੋਂ ਵੱਧ ਖੁਆਉਣ ਦੇ ਤਰੀਕਿਆਂ ਵਿੱਚੋਂ ਇੱਕ ਤਰੀਕਾ ਹੈ ਕਿ ਪਰਾਲੀ ਨੂੰ ਭਾਫ ਰਾਹੀਂ ਸੋਧਿਆ ਜਾਏ। ਭਾਫ ਦਾ ਪ੍ਰੈਸ਼ਰ 7 ਤੋਂ 10 ਕਿਲੋ ਪ੍ਰਤੀ ਵਰਗ ਸੈਂਟੀਮੀਟਰ ਹੋਣਾ ਚਾਹੀਦਾ ਹੈ।ਭਾਫ ਨਾਲ ਵੀ ਸੈਲੁਲੋਜ਼ ਅਤੇ ਹੈਮੀਸੈਲੁਲੋਜ਼ ਲਿਗਨਿਨ ਤੋਂ ਅੱਲਗ ਹੋ ਜਾਂਦੇ ਹਨ ਤੇ ਪਸ਼ੂ ਪਰਾਲੀ ਨੂੰ ਬਿਹਤਰ ਤਰੀਕੇ ਨਾਲ ਪਚਾ ਸਕਦੇ ਹਨ। ਇਸ ਵਿਧੀ ਰਾਹੀਂ ਪਸ਼ੂ ਵੱਧ ਪਰਾਲੀ ਖਾ ਸਕਦੇ ਹਨ। ਪਰ ਇਹ ਵਿਧੀ ਮੰਹਿਗੀ ਪੈਂਦੀ ਹੈ ਕਿਉਂਕਿ ਭਾਫ ਪ੍ਰਣਾਲੀ ਦੀਆਂ ਮਸ਼ੀਨਾਂ ਮੰਹਿਗੀਆਂ ਹਨ, ਕਈ ਵਾਰ ਜ਼ਿਆਦਾ ਭਾਫ ਦਾ ਸਮਾਂ ਦੇ ਦਿਤਾ ਤਾਂ ਪਰਾਲੀ ਵਿੱਚਲੇ ਸੂਖਮ ਪਦਾਰਥ ਸੱੜ ਸਕਦੇ ਹਨ ਤੇ ਪਸ਼ੂ ਸਗੋਂ ਪਰਾਲੀ ਨੂੰ ਮੂੰਹ ਨਹੀ ਲਾਉਂਦੇ।

5. **ਯੂਰੀਆ ਨਾਲ ਸੋਧਣਾ:** ਪਰਾਲੀ ਨੂੰ ਯੂਰੀਆ ਨਾਲ ਸੋਧਣ ਦੀ ਵਿਧੀ ਸੱਭ ਤੋਂ ਪ੍ਰਚੱਲਤ ਹੈ ਕਿਉਂਕਿ ਯੂਰੀਆ ਬਾਰੇ ਸਾਰੇ ਕਿਸਾਨ ਅਤੇ ਪਸ਼ੂ ਪਾਲਕ ਜਾਣੂ ਹਨ। ਇਸਦੀ ਉਪਲੱਭਤਾ, ਸੰਭਾਲ, ਵਰਤੋਂ (ਖਾਦਾਂ ਲਈ), ਸਾਵਧਾਨੀਆਂ ਅਦਿ ਬਾਰੇ ਵੀ ਸਾਰਿਆਂ ਨੂੰ ਸਮੇ ਸਮੇ ਤੇ ਖੇਤੀਬਾੜੀ ਮਹਿਕਮਾ ਸੂਚਿਤ ਕਰਦਾ ਰਹਿੰਦਾ ਹੈ। ਪਰਾਲੀ ਨੂੰ ਸੋਧਣ ਲਈ ਬਹੁ ਪ੍ਰਚੱਲਤ ਤਰੀਕਾ ਹੈ ਕਿ 400 ਕਿਲੋ ਪਰਾਲੀ ਲੈ ਕਿ 200 ਲਿਟਰ ਪਾਣੀ ਵਿੱਚ 14 ਕਿਲੋ ਯੂਰੀਆ ਦਾ ਘੋਲ ਬਣਾ ਕਿ ਛੱੜਕਾ ਕਰਨਾ ਹੈ ਤੇ ਫੇਰ ਤੰਰਗਲੀ ਨਾਲ ਪਲਟਾ ਕਿ ਪਰਾਲੀ ਦਾ ਕੁਪ ਅਜਿਹੀ ਥਾਂ ਤੇ ਬਣਾਉਣਾ ਹੈ ਕਿ ਮੀਂਹ ਹਨੇਰੀ ਤੋਂ ਬੱਚਿਆ ਜਾ ਸਕੇ। 10 ਦਿਨਾਂ ਬਾਅਦ ਕੁਪ ਖੋਲ ਕੇ ਆਹਿਸਤਾ ਆਹਿਸਤਾ ਲਵੇਰਿਆਂ ਨੂੰ ਗਿਝਾਉਣਾ ਹੈ। ਇਸ ਵਿਧੀ ਰਾਹੀਂ ਲਵੇਰੇ ਰੋਜਾਨਾ 3-4 ਕਿਲੋ ਪਰਾਲੀ ਅਰਾਮ ਨਾਲ ਖਾ ਸਕਦੇ ਹਨ। 1-2 ਕਿਲੋ ਦੁੱਧ ਵੀ ਵੱਧਦਾ ਹੈ ਤੇ ਲਵੇਰਿਆਂ ਨੂੰ ਕਬਜ ਵੀ ਨਹੀਂ ਹੁੰਦੀ।

ਕਈ ਵਾਰ ਯੂਰੀਆ ਸੋਧਣ ਦੇ ਨਤੀਜੇ ਤੱਸਲੀਬਖਸ਼ ਨਹੀਂ ਆਉਂਦੇ ਕਾਰਣ; ਯੂਰੀਆ ਦੀ ਮਿਕਦਾਰ, ਤਾਪਮਾਨ, ਕੁਪ ਬਨਣ ਦਾ ਸਮਾਂ, ਪਰਾਲੀ ਵਿੱਚਲੀ ਨਮੀ, ਪਰਾਲੀ ਦੀ ਕੁਆਲਿਟੀ ਆਦਿ। ਸਰਦੀਆਂ ਵਿੱਚ ਪਰਾਲੀ ਨੂੰ ਸੋਧਣ ਦੇ ਗਰਮੀਆਂ ਦੇ ਮੁਕਾਬਲੇ ਨਤੀਜੇ ਘੱਟ ਆਉਂਦੇ ਹਨ। ਜੇ ਯੂਰੀਆ ਸੋਧੀ ਪਰਾਲੀ ਪੋਲੀਥੀਨ ਵਿੱਚ 28 ਦਿਨਾਂ ਤਕ ਰੱਖੀ ਜਾਏ ਤਾਂ ਪਰਾਲੀ ਦੀ ਪੱਚਣ ਸ਼ਕਤੀ ਵਿੱਚ ਵਾਧਾ ਹੁੰਦਾ ਹੈ। ਸੋਧ ਲਈ ਵਰਤੀ ਜਾ ਰਹੀ ਪਰਾਲੀ ਦੀ ਨਮੀ 35-65 ਫੀਸਦੀ ਹੋਣੀ ਚਾਹੀਦੀ ਹੈ ਤਾਂ ਕਿ ਵੱਧ ਤੋਂ ਵੱਧ ਕੀਟਾਣੂ ਇਸਨੂੰ ਹਜਮ ਕਰ ਸਕਣ। ਸੋਧੀ ਹੋਈ ਪਰਾਲੀ ਨਾਲ ਬਗੈਰ ਹਰੇ ਚਾਰੇ ਤੋਂ ਕੱਟੜੂਆਂ-ਵੱਛੜੂਆਂ ਦਾ ਰੋਜਾਨਾ 250-300 ਗ੍ਰਾਮ ਭਾਰ'ਚ ਵਾਧਾ ਦੇਖਿਆ ਗਿਆ ਹੈ। ਇਸੇ ਤਰ੍ਹਾਂ ਲਵੇਰੀਆਂ ਦਾ ਦੁੱਧ ਵੀ 250 ਗ੍ਰਾਮ ਤੋਂ 1.5 ਕਿਲੋ ਤਕ ਵੱਧਦਾ ਹੈ।

UNICEL AY

Active Yeast Supplements

Live Yeast Cell Count (Saccharomyces) - 20.0, Billion*(cfu/gm)

UNICEL AY, is widely used as a feed additive in animals rations. it is confirmed to be an effective alternative to in-feed antibiotics and could increase the concentration of glucose (GLU) in the serum. It works by aiding the work of these digestive bacteria.

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For Feedback / Queries Please write to
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6. **ਜੀਵਾਣੂ ਸੋਧ:** ਪਰਾਲੀ ਨੂੰ ਪਸ਼ੂਆਂ ਲਈ ਹਜਮਯੋਗ ਬਣਾਉਣ ਲਈ ਅਜੱਕਲ ਕਈ ਕਿਸਮ ਦੇ ਖਮੀਰ (ਜਾਗ) ਵਰਤੋਂ ਵਿੱਚ ਲਿਆਂਦੇ ਜਾ ਰਹੇ ਹਨ। ਇਨ੍ਹਾਂ ਖਮੀਰਾਂ ਵਿੱਚ ਕਈ ਕਿਸਮ ਦੇ ਮਿੱਤਰ ਬੈਕਟੀਰੀਆ, ਯੀਸਟ ਅਤੇ ਉਲੀ ਦਾ ਇਸਤੇਮਾਲ ਹੁੰਦਾ ਹੈ। ਕੁਝ ਕੰਪਨੀਆਂ ਰੇਸ਼ੇ ਨੂੰ ਹਜਮ ਕਰਨ ਵਾਲੇ ਇੰਜ਼ਾਇਮ (ਓਨਜ਼ੋਮਏਸ) ਦੀ ਵਰਤੋਂ ਕਰ ਰਹੀਆਂ ਹਨ। ਜੇ ਪਰਾਲੀ ਨੂੰ 50-60 ਦਿਨ ਇਨ੍ਹਾਂ ਜੀਵਾਣੂਆਂ ਨਾਲ ਸਾਂਭ ਕੇ ਰਖਿਆ ਜਾਏ ਤਾਂ ਲਿਗਨਿਨ ਦੀ ਮਾਤਰਾ 35-40% ਫੀਸਦੀ ਘੱਟ ਜਾਂਦੀ ਹੈ, ਸੈਲੁਲੋਜ਼ ਅਤੇ ਹੈਮੀਸੈਲੁਲੋਜ਼ 50% ਫੀਸਦੀ ਵੱਧ ਹਜਮ ਹੁੰਦੇ ਹਨ। ਜਿਹੜੇ ਕਿਸਾਨ ਕਹਿੰਦੇ ਸੀ ਕਿ ਪਰਾਲੀ ਗੋਹੇ ਵਿੱਚੋਂ ਸਾਬਤੀ ਨਿਕਲ ਰਹੀ ਹੈ, ਉਨਾਂ ਦੇ ਮੁਤਾਬਿਕ ਹੁਣ ਇਕ ਵੀ ਕਣ ਪਰਾਲੀ ਦਾ ਗੋਹੇ ਚੋਂ ਬਾਹਰ ਨਹੀਂ ਆਉਂਦਾ। ਦੁੱਧ ਦੀ ਪੈਦਾਵਾਰ ਬਿਨਾ ਹਰੇ ਤੋਂ ਵੀ ਬਰਕਰਾਰ ਰਹਿੰਦੀ ਹੈ।

ਪਰਾਲੀ ਦਾ ਬਿਛਾਉਣਾ: ਇੱਕ ਲਵੇਰਾ 24 ਘੰਟਿਆਂ ਵਿੱਚੋਂ ਲਗਭਗ 15-16 ਘੰਟੇ ਬੈਠਣਾ ਚਾਹੁੰਦਾ ਹੈ। ਉਹ ਬੈਠ ਕੇ ਜੁਗਾਲੀ ਕਰਨਾ ਚਾਹੰਦਾ ਹੈ। ਉਸਨੂੰ ਬੈਠਣ ਵਾਲੀ ਜਗਾਹ ਨਰਮ ਚਾਹੀਦੀ ਹੈ, ਸੁੱਕੀ ਚਾਹੀਦੀ ਹੈ ਤੇ ਸਰਦੀਆਂ ਵਿੱਚ ਨਿਘੀ ਅਤੇ ਗਰਮੀਆਂ ਵਿੱਚ ਠੰਡੀ ਚਾਹੀਦੀ ਹੈ। ਨਰਮ ਫਰਸ਼ ਨਾਲ ਜਿੱਥੇ ਲਵੇਰੇ ਨੂੰ ਆਰਾਮ ਮਿਲਦਾ ਹੈ, ਸੱਟਾਂ ਘੱਟ ਲਗਦੀਆਂ ਹਨ ਉਥੇ ਥੱਣਾਂ ਦਾ ਸੋਜਾ ਵੀ ਘੱਟ ਜਾਂਦਾ ਹੈ। ਬਿਨ੍ਹਾਂ ਅਰਾਮਦਾਇਕ ਫਰਸ਼ਾਂ ਸਦਕਾ ਲਵੇਰੇ ਲੰਗ ਮਾਰਨ ਲੱਗ ਜਾਂਦੇ ਹਨ। ਪਰਾਲੀ ਇੱਕ ਬਹੁਤ ਉਪਯੋਗੀ ਬਿੱਛ ਸਾਬਤ ਹੋਈ ਹੈ। 3-4 ਇੰਚ ਮੋਟੀ ਤਹਿ ਪਰਾਲੀ ਦੀ ਜੇ ਲਵੇਰਿਆਂ ਦੇ ਹੇਠਾਂ ਰੱਖੀਏ (ਖਾਸ ਕਰਕੇ ਸਰਦੀਆਂ'ਚ) ਤਾਂ ਉਹ ਲੰਬਾ ਸਮਾਂ ਬਹਿੰਦੀਆਂ ਹਨ, ਜੁਗਾਲੀ ਵੱਧ ਕਰਦੀਆਂ ਹਨ, ਦੁੱਧ ਵੀ ਵਧਾਉਦੀਆਂ ਹਨ। ਨਵ ਜੰਮੇ ਕੱਟਰੂ-ਵੱਛਰੂ ਲਈ ਪਰਾਲੀ ਬਹੁਤ ਹੀ ਲਾਭਦਾਇਕ ਸਿੱਧ ਹੁੰਦੀ ਹੈ; ਇਹ ਫਾਲਤੂ ਨਮੀ ਸੋਕ ਸਕਦੀ ਹੈ, ਨਵ ਜੰਮੇ ਨੂੰ ਸੱਟ, ਫਿਸਲਣ ਦਾ ਖੱਤਰਾ ਘੱਟਦਾ ਹੈ, ਨਿੱਘ ਮਿਲਦਾ ਹੈ। ਪਰਾਲੀ ਫਾਲਤੂ ਅਮੋਨੀਆਂ ਗੈਸ ਵੀ ਬਣਨ ਨਹੀਂ ਦਿੰਦੀ, ਮੋਕ ਘੱਟ ਲੱਗਦੀ ਹੈ। ਅੱਜਕਲ ਬਜਾਰ'ਚ ਵਿੱਕ ਰਹੇ ਰੱਬੜ/ਪਲਾਸਟਿਕ ਦੀਆਂ ਦਰੀਆਂ ਨਾਲੋਂ ਪਰਾਲੀ ਦੀ ਸੁੱਕ ਸੱਸਤੀ ਪੈਂਦੀ ਹੈ। ਇਸਨੂੰ 4-5 ਦਿਨਾਂ ਬਾਅਦ ਵਰਤ ਕੇ ਕੰਪੋਸਤ ਬਣਾ ਲੈਣੀ ਚਾਹੀਦੀ ਹੈ।

ਕੰਪੋਸਤ (ਖਾਦ): ਡੇਅਰੀ ਫਾਰਮ ਤੇ ਉਪਲੱਭਦ ਗੋਹੇ ਤੇ ਪਰਾਲੀ ਦਾ ਮਿਸ਼ਰਣ ਇੱਕ ਬਹੁਤ ਵੱਧੀਆ ਜੈਵਿਕ ਖਾਦ ਦੇ ਰੂਪ'ਚ ਵਰਤਿਆ ਜਾ ਰਿਹਾ ਹੈ। ਗੋਹੇ ਤੇ ਪਰਾਲੀ ਦਾ ਸੁਮੇਲ ਇੱਕ ਗੁਣਕਾਰੀ ਖਾਦ ਤਿਆਰ ਕਰਨ'ਚ ਸਹਾਈ ਹੁੰਦਾ ਹੈ ਕਿਉਂਕਿ ਗੋਹੇ ਵਿੱਚ ਨਮੀ ਦੇ ਨਾਲ ਨਾਲ ਪ੍ਰੋਟੀਨ ਭਾਵ ਨਾਈਟ੍ਰੋਜਨ ਤਾਂ ਬਹੁਤ ਹੁੰਦੀ ਹੈ ਪਰ ਕਾਰਬਨ ਦੀ ਮਾਤਰਾ ਘੱਟ ਹੁੰਦੀ ਹੈ ਜੋ ਕਿ ਪਰਾਲੀ ਵਿੱਚ ਭਰਭੂਰ ਹੰਦੀ ਹੈ। ਇਹ ਦੇਖਿਆ ਗਿਆ ਹੈ ਕਿ ਸ਼ੁਰੂ ਵਿੱਚ ਇਸ ਮਿਸ਼ਰਣ ਦੀ ਨਮੀ 65% ਫੀਸਦੀ ਹੁੰਦੀ ਹੈ ਜੋ ਕਿ ਜੀਵਾਣੂਆਂ ਦੇ ਵਾਧੇ ਲਈ ਉਪਯੋਗੀ ਹੁੰਦੀ ਹੈ ਤੇ ਇਸ ਨਾਲ ਅੰਦਰ ਦਾ ਤਾਪਮਾਨ ਵੀ ਵੱਧਦਾ ਹੈ ਅਤੇ ਅਮੋਨੀਆ ਗੈਸ ਵੀ ਘੱਟ ਬਣਦੀ ਹੈ।

ਉਪਰ ਲਿੱਖੇ ਗੁਣਾਂ ਕਰਕੇ ਜਿਨਾ ਹੋ ਸਕੇ ਸਾਨੂੰ ਵੱਧ ਤੋਂ ਵੱਧ ਪਰਾਲੀ ਦਾ ਇਸਤੇਮਾਲ ਕਰਨਾ ਚਾਹੀਦਾ ਹੈ। ਭਾਵੇਂ ਇਸਨੂੰ ਇਸਤੇਮਾਲ ਕਰਨ ਵਿੱਚ ਮਿਹਨਤ ਅਤੇ ਵਕਤ ਸਿਰ ਬੰਦਿਆਂ ਦੀ ਜਰੂਰਤ ਪੈਂਦੀ ਹੈ ਪਰ ਇਹ ਆਪਣੀ ਸਿਹਤ, ਵਾਤਾਵਰਣ ਅਤੇ ਪੰਜਾਬ ਵਾਸਤੇ ਅਤਿ ਜਰੂਰੀ ਹੈ।

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01-03 MARCH 2024

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Web : www.ipdlexpo.com

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01-04 OCTOBER 2024

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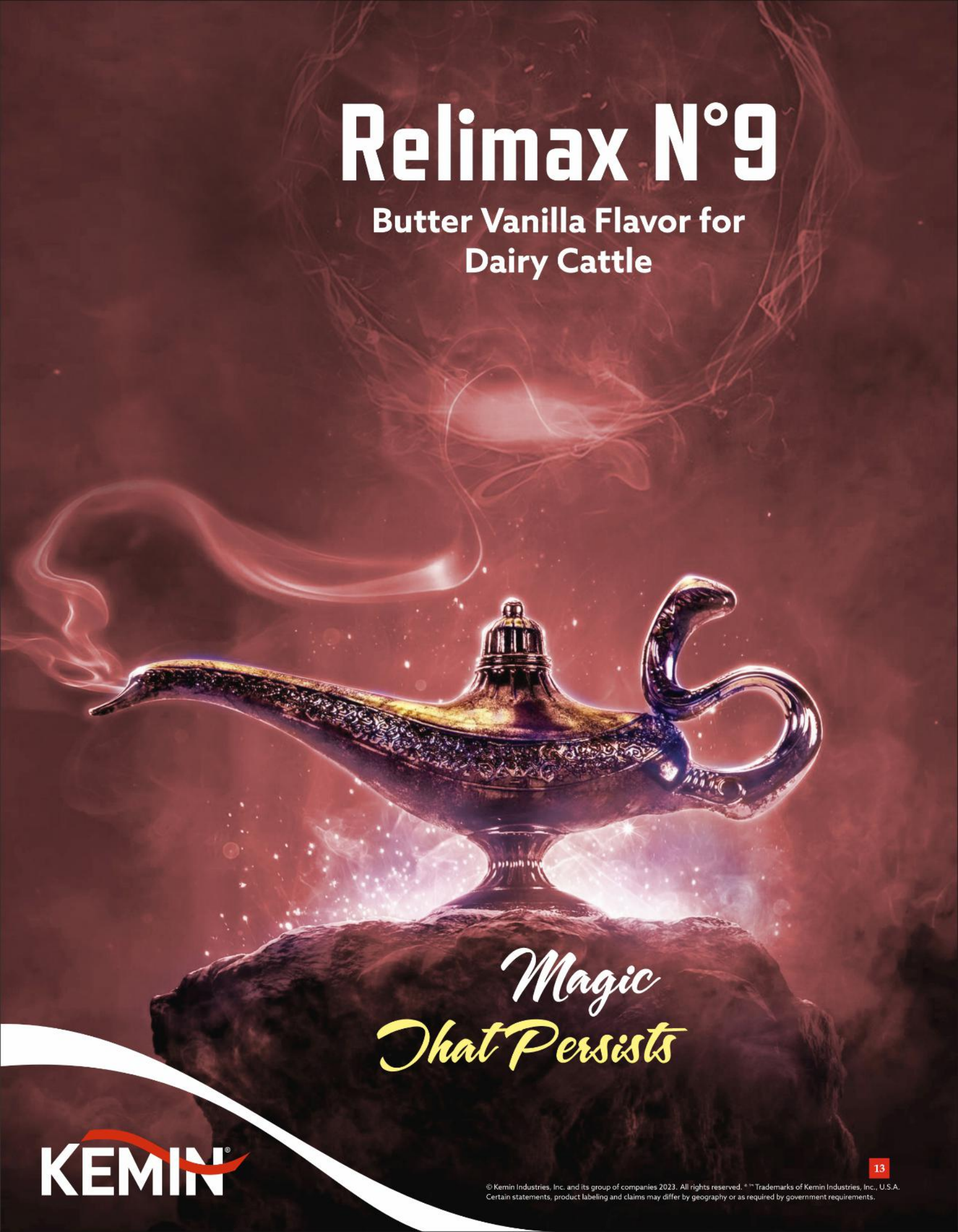

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ARTICLE

ENCAPSULATION IN FEED INDUSTRY: AN OVERVIEW

Dr. Vinit Maru, Dr. S. M. Wankhede I/C
Professor Dept. of Animal Nutrition COVAS, Parbhani

Abstract

Encapsulation is one of the processes where bioactive core compounds are coated with various carrier materials to protect them against external as well as internal adversities and to ensure the viability of the active ingredients for longer periods. Application of such kind of techniques has increased since bioactive materials can be protected from moisture, heat, or other extreme conditions, thus enhancing their stability as well as maintaining their quality. Encapsulation is used in many fields such as pharmacology, chemistry, cosmetics, medicine, biotechnology, textile, agriculture and food. Without encapsulation, many compounds lose their activity due to feed processing, storage or even in the rumen or stomach before being absorbed from the small intestine and are being utilized by the body.

Present Scenario of Encapsulation Industry

The food encapsulation market was valued at USD 11.5 billion in 2022; it is projected to grow at a compound annual growth rate (CAGR) of 8.2% to reach USD 17.0 billion by 2027. The encapsulation market is growing globally at a significant pace due to its numerous applications and multiple advantages over other technologies. Also factors such as rising demands for encapsulated feed additives, vitamins and minerals, and growing demand for dietary supplements that use encapsulated bioactive compounds and advancements in technology to increase animal production with the product quality play a role in its growth.

The results from the research and experimentation with encapsulated nutrients are astounding. The productivity of the animal is found to be increased greatly at the same time the cost of feeding has been reduced as new technologies are fabricating cheap but high-quality products.

Encapsulation was already used in the pharma and agricultural industries for the past five-six decades but it is gaining popularity in animal nutrition since these two decades. In the agriculture industry encapsulation is used in the manufacturing of biofungicides, biopesticides, biofertilizers etc. The human food industry uses encapsulation the most. Encapsulated ingredients are used in every food product category such as confectionary, beverages, dairy, ready-to-eat snacks and also in convenience foods.

Objectives

Some of the objectives of encapsulation are to increase the stability of formulated systems, retain and protect active properties, reduce lipid oxidation and maintain the bioactive compounds even in extreme thermal, radiation and pH conditions. Encapsulation can also help in the site-specific release of ingredients at controlled time and rate, increase shelf life and masking undesirable flavour, colour and taste.

Microencapsulation and nanoencapsulation

These are the most commonly used techniques nowadays. Nanoencapsulation dispenses particle size of less than 1 micron, while microencapsulation dispenses a particle size between 1 to 1000 microns. Various techniques produce particles in the form of microspheres or microcapsules. Microspheres are dense matrix systems in which the bioactive compound is homogenously dispersed or suspended with the carrier material. Microcapsules are reservoir systems in which the bioactive compounds are heterogeneously separated, where the carrier material forms a membrane shell around the core bioactive compound.

Carrier materials used for encapsulation

Determining the appropriate carrier material is important as it has to be compatible with the core material, be stable and should protect the core material from external adversities.

Ideal coating materials should have the following properties

Machinability- Should be able to handle physical feed processing methods.

Inert- Should not react with the core material both during processing and storage.

Protection- Should protect the core material against various physical and chemical adversities.

Economical- Should be cheap and easily available.

It is difficult for a single carrier material to have all the properties so different combinations of materials are used. Food biopolymers are generally used.

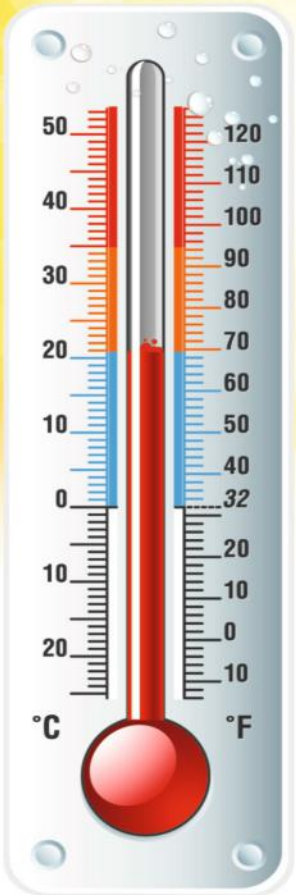
Biopolymers are of three types

1) Synthetic polymers derived from petroleum. Eg. Polyethylene glycol, polyvinyl alcohol, etc.
2) Synthetic polymers derived from renewable resources. Eg. poly(lactic acid) (PLA), poly(glycolic acid) (PGA), etc.
3) Naturally produced renewable polymers. Eg. chitosan, maltodextrin, alginate, gelatin, etc.

Core material used in encapsulation

Core materials are sensitive bioactive compounds, with low stability and are highly susceptible to variations in temperature, light, pH, or other environmental conditions. To improve their stability and bioavailability there is a need to encapsulate these bioactive compounds. Many volatile and heat-sensitive compounds like polyphenols and essential oils can be saved from being degraded by various feed processing methods and in long storage periods. Some compounds like vitamins, minerals, probiotics and bioactive peptides are functional only if released at a specific site, at a particular time. Due to development in encapsulation technologies, the release of these bioactive compounds can be site-specific, stage-specific or even signalled by any physio-chemical changes in the animal body.

Temperature is rising...



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Heat stress adversely impacts dairy cow performance

Did you know that heat stress can cost over 400€/cow/year[1]? The consequences of heat stress include significant losses in milk production, (which can be up to 35%), coupled with rumen dysfunction and reduced reproduction rates.
The level and impact of heat stress on cows is influenced by a combination of ambient temperature and relative humidity. New research has shown that temperatures in excess of 20°C and 50% relative humidity[2] will lead to cow discomfort and reduced milk production.

1 Saint Pierre et al., 2003 - 2 Burgos & Collier, 2011.

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**Marfola, et al, ADSA 2010.*

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Some animal as well as plant-based feed additives like fish oil, terpenes and tannins have an unpalatable taste as well as undesirable odour. This decreases the animal's feed intake and affects production, therefore encapsulating these compounds is important before adding them to an animal's feed. Encapsulation allows active ingredients such as polyphenols, carotenoids, pigments, fatty acids, phytosterols, probiotics, vitamins, minerals, and bioactive peptides to be trapped within a core of different carriers. Generally, the stability of these bioactive compounds is low, and encapsulation generates a powder with higher stability against variations in temperature, light, pH, or oxygen, increasing the release rate of these active ingredients.

Novel technologies of Encapsulation

The human population is increasing and so is the demand for animal products. To meet these increasing demands animal feed industry is being upgraded and various new encapsulation techniques are being researched to enhance the quality of feed. Some of these techniques are given below.

Spray drying:- It is the most commonly used and most economical method in which the core bioactive material is homogenized with the carrier material to form an emulsion and passed through hot air using an atomization process to obtain a powdered encapsulated product.

Freeze drying:- It is a process based on dehydration by sublimation of the emulsion of the bioactive core material and carrier material. It is used for sensitive bioactive compounds as it does not expose the emulsion to high temperature as in spray drying.

Extrusion:- In this method two immiscible compounds (core material and carrier material) are dispersed and passed through a dye or nozzle, obtaining droplets into a drying agent in which the carrier materials surrounds the core material.

Coacervation:- It is a method where two or more polymeric and charged carrier materials form a membrane of tiny coacervates around the core material by altering their physiochemical properties and inducing phase separation.

However, the selection of the technique depends on several factors such as the type of bioactive compounds, encapsulating agent, the sensitivity of bioactive compounds and the cost of the technique. Each technique will give different results in terms of shape, structure, size, distribution and bioavailability

Conclusion

Encapsulation of nutrients is an amazing technology which if used appropriately could revolutionize the animal nutrition industry. The positives of this technology surpass the negatives and we could really use it to increase production in animals. The cost of manufacturing encapsulated products is low, and the ruminal or stomach degradation in animals is reduced moreover it results in site-specific release of nutrients are excellent and should be taken into account.

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Exogenous Fibrolytic Enzymes in Ruminants

[1]Khwairakpam Ratika, [2]Rajkumar James Singh, [3]Kshetrimayum Mahesh Singh and [4]Neithono Kuotsu
[1,3,4]College of Veterinary Sciences & AH, CAU Jalukie, Nagaland
[2]Indian Veterinary Research Institute, Izatnagar, Bareilly

Introduction

Enzymes are proteins that catalyze chemical reactions in biological systems. Exogenous means an action or object coming from outside a system so exogenous fibrolytic enzymes are fibre degrading enzymes, supplemented to the animal from exogenous sources.

The ruminant production systems are dependent worldwide on forage as the main nutritional components. The microbial mode of digestion allows ruminants to better unlock the unavailable energy in the plant cell wall components than other herbivores. This gives ruminant animals the ability to convert low nutritive and resistant lignocellulosic biomass to milk, meat, wool and hides. However, most forage plants are high in cell walls and low in nitrogen (N) and energy content. Despite the importance of fibrous components in forages for salivation, rumen buffering and efficient production of ruminal end products, only 10 to 35% of energy intake is available as net energy. This is because the ruminal digestion of plant cell walls is not complete. The use of exogenous fibrolytic enzymes (EFE) to enhance quality and digestibility of fibrous forage is on the verge of delivering practical benefits to ruminant production systems. In this regard, cellulases and xylanases are respectively amongst the two major enzyme groups that are specified to break ß1-4 linkages joining sugar molecules of cellulose and xylans found in plant cell wall components.

Although enzyme products marketed for livestock number in the hundreds, they are derived primarily from only four bacterial (Bacillus subtilis, Lactobacillus acidophilus, L. plantarum, and Streptococcus faecium, spp.) and three fungal (Aspergillus oryzae, Trichoderma reesei, and Saccharomyces cerevisiae) species.

Mode of action of exogenous fibrolytic enzymes.

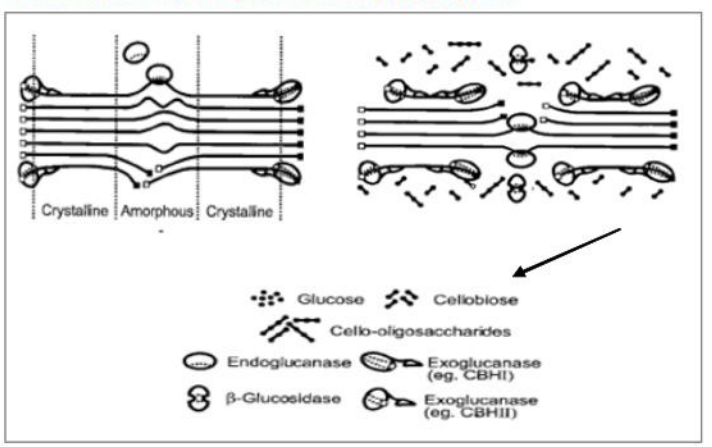

Figure 1. Schematic representation of the hydrolysis of amorphous and microcrystalline cellulose by cellulase system.

In nature, complete cellulose hydrolysis is mediated by a combination of three main types of celulases: (1) endoglucanases , (2) exoglucanases, including cellobiohydrolases (CBHs), and (3) ? -glucosidase (BG) . Endogucanase are active on the non- crystalline or amorphous region of cellulose and their activity yields cellobiose and cello-oligosaccharides as hydrolytic product. Cellobiohydrolases are processive enzymes that are active on the crystalline region of cellulose and their activity yield almost exclusively cellobiose as their main hydrolysis product. In turn beta- glucosidase convert cellobiose and some cello-oligosaccharides to glucose (fig. 1).

Action of xylanase

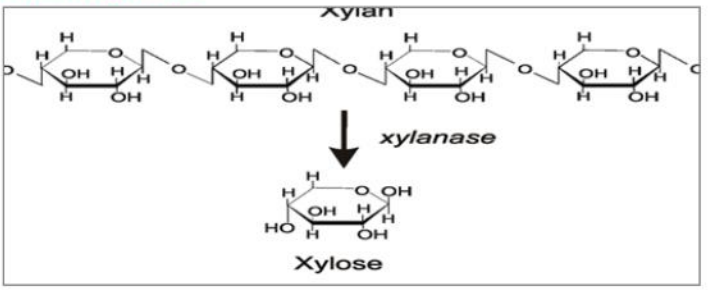

Figure 2 Action of Xylanase

Xylanase is the name given to the class of enzymes which degrade the linear polysaccharides beta-1,4, xylan to xylose thus, breaking down hemicellulose, one of major components of plant cell wall.

Pre-ingestive Effects

Exogenous enzymes are most effective when applied to feed prior to ingestion by cattle. The adsorption of enzyme onto the substrate is an important prerequisite for hydrolysis. Applying exogenous enzymes directly to feed causes a release of reducing sugars and in some cases, partial solubilization of neutral detergent fibre and acid detergent fibre. This release of soluble sugars would provide sufficient additional available carbohydrates to encourage rapid microbial growth, shortening the lag time required for microbial colonization. However, the quantity of sugars liberated represents only a minute portion of the total carbohydrate present in the diet. There is evidence that applying fibrolytic enzymes to feed prior to feeding alters the structure of the feed, thereby making it more amenable to degradation. Another important reason for applying enzymes to feed prior to ingestion is to enhance binding of the enzyme to the feed, thereby increasing the resistance of the enzymes to proteolysis in the rumen. Enzymes applied to feed prior to ingestion are particularly stable; the presence of substrate is known to increase enzyme resistance to proteolytic inactivation.

Ruminal Effects

Previously it was assumed that the proteolytic activity in the rumen ecosystem would rapidly inactivate unprotected enzyme feed additives. However, more recent studies have shown that exogenous enzymes in the rumen are generally more stable than previously thought, particularly when added to feed pre-ingestion. The stability in the rumen may be related to their glycosylation, which may protect them from inactivation from temperature and proteases. However, there can be differences depending on the source organism, the enzyme activity, and whether the enzyme product is applied to feed.

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Exogenous enzymes improve digestion by increasing the hydrolytic capacity within the rumen environment. This hypothesis is difficult to verify because of the complexity of measuring the enzyme activity within the rumen. The actual increase in hydrolytic capacity in the rumen due to exogenous enzymes may be greater than calculated from microbial and exogenous enzyme activity due to synergism.

Synergy between exogenous enzymes and rumen microbial enzymes can be defined as the enhanced effect of these two entities acting cooperatively. The net effect is the increase in enzymic activity that exceeds the additive effects of each of the individual components. Synergy among cellulases and xylanases has been extensively documented by enzymologists. Synergy among microorganisms in the rumen, including crossfeeding of hydrolysis products, utilization of end products, and production of an essential nutrient, is well documented.

Conditions in the rumen of intensively reared ruminants are often suboptimal for growth of fibrolytic bacteria. Typically,diets fed to dairy cows and feedlot cattle are highly fermentable causing ruminal pH to remain below optimum (approximately pH 5.9) for fibre digestion for extended periods each day. However, some exogenous enzymes commonly employed as additives are optimally active at lower pH than ruminal enzymes. Thus, it has been speculated that their addition might be of greater benefit when pH conditions are suboptimal for fibrolytic ruminal bacteria. There is some evidence that exogenous enzymes stimulate the attachment of rumen microbes to plant fibre, which may partially explain how small quantities of enzymes can improve rate of fibre degradation.

Attachment of rumen microorganisms to some components of forage fibre, such as mesophyll and phloem tissue, is essential for the digestion of feedstuffs in the rumen. Adherence of rumen bacteria to fibre places the enzyme-system in close proximity to the substrate, and disrupts the hydrogen bonding within the cellulose matrix. The mechanism by which fibrolytic enzymes stimulate the attachment of rumen bacteria to plant cell walls remains unknown. It is possible that applying enzymes to feed causes the release of soluble sugars from feed, thereby increasing the chemotactic attraction and eventual attachment of fibrolytic rumen bacteria to the plant surface. The application of enzymes to feed may also increase attachment by increasing the "roughness" of the feed surface making it more suitable for microbial colonization. Feed enzymes may weaken the surface of the feed thereby removing some of the physical barriers that impede microbial attachment. There is also some evidence that adding feed enzymes to the diet indirectly increases numbers of non-fibrolytic, as well as fibrolytic, bacteria in the rumen.

Post ruminal effect

Some exogenous enzymes survive ruminal fermentation and the abomasal environment and may exert activity for a period of time in the small intestine. In general, xylanases are more stable in the rumen and abomasum than cellulases and consequently xylanase activity in the small intestine that is attributable to exogenous enzymes is usually greater than cellulase activity. Approximately 30% of xylanases can escape ruminal fermentation and are active in intestinal digesta of ruminants. Some exogenous enzymes are remarkably resistant to microbial proteases, bypass the abomasums, and remain active in the small intestine and have even been shown to linearly increase polysaccharide-degrading activities in feces. However, the practical implication of these effects remains unclear.

Production response of dairy cattle to exogenous fibrolytic enzymes

Chandra et al. (2010) evaluated the effect of commercial exogenous fibrolytic enzyme (EFE) mixture added at 1.5 and 3.0 g (cellulase 4,000 µM glucose/g/h?+?xylanase 7,990 µM xylose/g/min; 50:50 w/w) per kilogram of dry matter (DM) of feed on nutrient digestibility, milk production, milk composition, and some blood constituents in lactating Murrah buffaloes. Eighteen buffaloes were allotted to three dietary treatments, on the basis of milk yield (8.48, 8.52, and 8.53 kg/day) and days in lactation (68.5, 80.33, and 82.00) for 90 days. The buffaloes were fed a total mixed ration (TMR) comprising of 45% chaffed wheat straw, 15% chopped green maize, and 40% concentrate on DM basis (control group), the same TMR plus EFE at 1.5 g/kg DM (T-1 group) and the same TMR plus EFE at 3.0 g/kg DM (T-2 group) supplemented through the concentrate mixture. There was no effect of fortifying EFE mixture on DM intake and crude protein intake (grams per day) whereas total digestible nutrients intake (kilogram per day) was higher by (P?<?0.05) 12.53% in T-1 group over that of control, and there was no significant difference between T-2 and control groups. The average daily milk yield and 4% fat-corrected milk (FCM) yield was higher (P?<?0.05) by 12.99% and 15.17% in T-1 group as over that of control, and there was no difference between T-2 and control groups. It is concluded that supplementation of cellulase and xylanase mixture at 1.5 g/kg of DM of TMR containing wheat straw (45%), green maize (15%), and concentrate (40%) on DM basis significantly increased (P?<?0.05) the average daily milk yield and FCM yield in Murrah buffaloes due to improved dietary fiber digestion.

Table 1. Summary of exogenous fibrolytic enzymes effects on production traits and total tract apparent digestibility of nutrients in lactating dairy cows

Reference	Enzyme	Appl. level	Forage level	DMI	Milk yield	Milk components	Total tract dig.
Yang et al., 1999	Cellulase xylanase	0.5- 1g/kg	55%	-		-	OM and ADF
Kung et al., 2002	Cellulase Xylanase	10L/t fresh forage	50%	-		MF	NR
Bernard et al., 2010	cellulase	4g/cow per day	50-54%	-	-	-	NR
Arriola et al., 2011	Cellulase xylanase	3.4mg/g TMR DM	52-67%	-	-	-	All

Conclusions

- Exogenous fibrolytic enzymese to ruminant diets improve production and digestibility of nutrients in ruminants.
- Limited understanding of factors affecting enzyme activity in feeds give inconsistent results.

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Vitamin E - A Powerful Health Promoter for Dairy Cows

Vitamin E is essential for optimum functioning of many biological systems in animals. It has important functions in the muscular, nervous, circulatory, reproductive and immune system. Vitamin E is also one of the most potent biological antioxidants and a free radical scavenger, functions that are well established and described in the scientific literature. This paper deals with the fundamental role of vitamin E in animal health, its outstanding effect on the immune system and on the prevention of mastitis in dairy cows.

Vitamin E- the effective mastitis fighter

Mastitis is a widespread disease in all major dairying countries despite the considerable progress that has been made in mastitis control over the past 30 years. Milk production potential from the modern dairy cow has soared worldwide: the UK Institute for Animal Health reckons that milk flow rates from the average cow have doubled in the last 60 years.

However, the downside of this improvement is also a 12-fold increase in susceptibility to mastitis over the same period. Other research puts the prevalence of clinical mastitis in modern dairy herds at an average 45 cases per 100 cows. The percentage of subclinical mastitis on average is very much higher. These cases are often unnoticed in the cows themselves and only identified by a very high somatic cell count (SCC) in bulk milk samples. Preventative measures against what has become the most important health problem - one can consider it as a professional disease - of dairy cows include careful hygiene in the milking routine, at drying-off and regular milking equipment maintenance. But often overlooked is the crucial effect of dairy cow nutrition in encouraging a natural resistance to the mastitis-causing microorganisms within the animal metabolism. Reliable trial results for more than two decades have pointed to supplementary vitamin E as the most effective dietary method of reducing the incidence of both clinical and subclinical mastitis.

When we talk about profit loss through mastitis there's no getting away from the fact that the damage is substantial. For instance, Dutch research in 2008 with input from the Dutch Royal Cattle Syndicate, found an average 25% of even first-calvers in a sample of 173 typical dairy herds were infected with subclinical mastitis in the first 100 days of lactation. The first sign is a substantial increase of the SCC (somatic cell count) in milk and this symptom brings with it a corresponding drop in milk yield. A bulk milk SCC of 250 000/ml can result in a milk yield reduction of more than 100 kg/cow/year and, when the count tops 300 000/ml, more than 250 kg/cow/year are lost. In a herd with low incidence of mastitis bulk tank samples should have less than 150 000 cells/ml. Milk with a SCC of greater than 400 000/ml is not permitted to enter the food chain. The results of Swedish research at the University of Uppsala's Faculty of Veterinary Medicine indicate - for multiparous cows as well as heifers - that clinical mastitis can cost as much as € 275 and subclinical cases around € 60 per lactation. The same research found milk yields were reduced by 150 l in the case of heifers and an average 450 l for cows. Taking a milk price of 0.35 €/kg this meant a loss of € 52.50 in heifers and € 175.50 in multiparous cows (Table 1).

	Primiparous cows	Multiparous cows
Clinical mastitis (€)	275	275
Subclinical mastitis (€)	60	60
Milk yield loss (kg in 305 d)	150	450
Profit loss @ 0.35 €/kg milk	52.50	175.50

Table 1: The cost of clinical and subclinical mastitis (Nielsen, 2009).

The major problem with mastitis is that it affects much more than milk sales. It is also associated with inflamed and swollen udder quarters - painful to the cow and thus not only a health issue but also an animal welfare problem. Moreover the disease leads to infertility - missed services and longer "empty" days. Sometimes udder quarters are lost to production. In the end, these developments result in increased culling which means the early loss of a good milker, and her genes for future generations in the herd. A survey of the USDA (2007) shows that 23% of cows leaving the herds too early in life are culled because of udder health. After infertility mastitis is the next most important reason for culling on dairy farms.

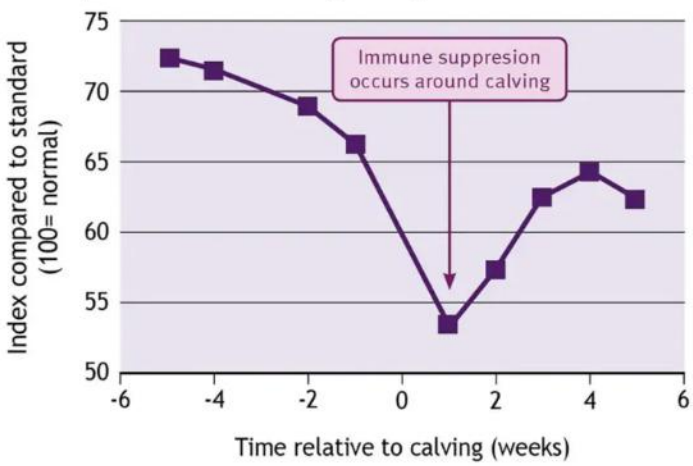

Figure 1: Neutrophil function analysis around calving from 137 Holstein cows (adapted from Kehrli et al., 1994).

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There is clear evidence that vitamin E blood levels in dairy cows are always comparatively low at times in the milking cycle when cattle are most susceptible to metabolic disorders. These disorders include the well-known milk fever at calving, but also infections and subsequent diseases. They all occur during the so-called per parturient or transition period that covers the last 10% of the gestation period and the first few weeks into lactation. It is also universally agreed that a component of this stressful time for the cow is a low level of immune response. Figure 1 shows that the neutrophil function is very much depressed around calving, putting cows at greatest risk of developing metabolic and/or infectious diseases after or during calving (Figure 2).

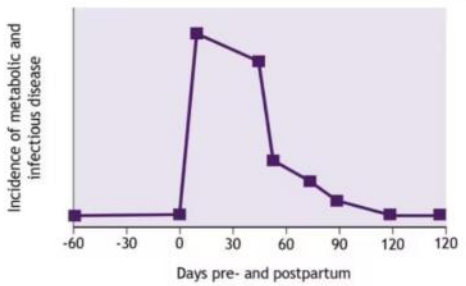


Figure 2: Disease threat is greatest at calving time (Nelson, 1999).

Here plasma vitamin E levels play an important role. Studies have confirmed that plasma vitamin E concentration declines by about 50% in the period around calving and reaches levels that would be diagnostic of chronic deficiency (Figure 3).

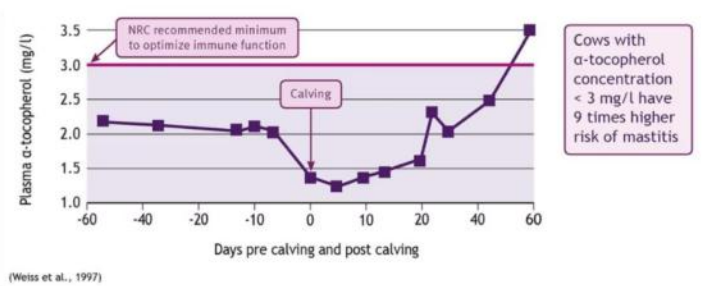


Figure 3: Minimum plasma vitamin E levels recommended by the NRC (2001) to reduce the incidence of mastitis.

The loss is 4 VITAMIN E: A powerful health promoter for dairy cows partly due to sequestration in colostrum. But vitamin E is also consumed at a higher rate as a result of increased immunologic and metabolic stress before calving. An important result is that resistance to disease is weakened. Scientists point out that good resistance relies in part on rapid migration of bacteria-killing neutrophils (immune cells that are the body's first line of cellular defense) from the blood to the site of infection, for instance to the mammary gland being threatened by invading mastitis-causing microorganisms.

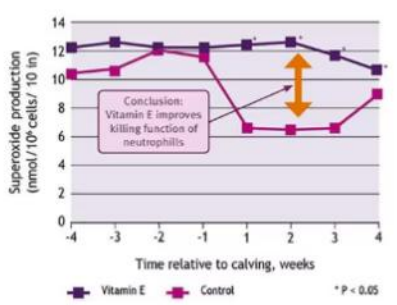
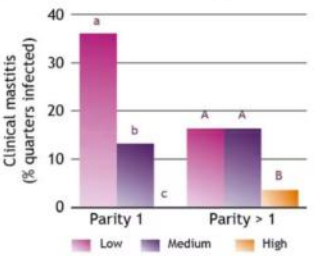


Figure 4: Superoxide production by blood neutrophils from control and vitamin E supplemented dairy cows (adapted from Politis et al., 1995)

This reaction time is slow when vitamin E blood levels are low. It has been clearly demonstrated that cows with low plasma vitamin E levels before calving have a 9 times higher probability of clinical mastitis compared to cows with an acceptable blood level (figure 3).

This was recognized by the NRC (National Research Council Committee for Animal Nutrition in the US) in 2001. In its supplementation guidelines it recommends higher dietary vitamin E levels for transition and lactating cows to maintain the minimum plasma vitamin E concentration for optimum immune response. Trials reliably prove that supplementary vitamin E replenishes blood levels with a resultant boost to neutrophil reaction and their subsequent control of those pathogenic "invaders" (Figure 4). While first lactation cows already responded to medium levels of vitamin E, older cows needed higher levels of vitamin E pre and post-partum to reduce the prevalence of mastitis at calving (Figure 5).

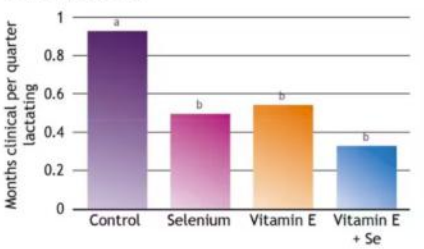


Treatment: Vitamin E	Dry period	Lactation
Low	100 mg/d	100 mg/d
Medium	1000 mg/d	500 mg/d
High	1000 mg/d for 46 d 4000 mg/d for 14 d	2000 mg/d

a, b, c differ: $p < 0.05$; A, B differ: $p < 0.05$

Figure 5: ROVIMIX® E supplementation reduces the prevalence of clinical mastitis of dairy cows at parturition (Weiss et al., 1997).

Figure 6 shows that vitamin E and selenium have a complementary effect on the duration of mastitis. The combination of both reduced the duration of the clinical symptoms of mastitis by 62% compared to the control.



Treatments:	
Vitamin E	1000 mg Vitamin E/ animal/day during dry period
Selenium	Injection of 0.1 mg Se/kg BW on d 21 pre-calving

a, b differ: $p < 0.05$

Figure 6: ROVIMIX® E and selenium decreased the duration of clinical mastitis (Smith et al., 1984).

OVN™ Vitamin E supplementation: the answer. Considerable progress has been made in our understanding of vitamin nutrition of dairy cows during the last 15 years. Based on the latest evidence it can be concluded that vitamin E helps to optimize immune function and that it is indispensable for udder health and milk quality. The OVN™ vitamin E recommendations have been compiled based on NRC guidelines, published data and from field trials (Table 2). The response benefit helps to optimize, not only performance and milk quality, but also cow health and welfare. Healthy cows are important for saving costs, thus increasing profits and ensuring longer and more productive milking lifetimes.

	mg vitamin E /hd/d
Dairy Cows	
Far off & close up	1000-3000
Transition	1000-3000
Lactation	500-1000
Heifers	
4-6 weeks before calving	1000-3000

Table 2: OVN™ supplementation guidelines.

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GADVASU Conducts Dairy Stakeholders Workshop

A one day workshop on the theme Opportunity and Challenge in Dairy Farming was conducted by Directorate of Extension Education, Guru Angad Dev Veterinary & Animal Sciences University, Ludhiana in association with Progressive Livestock Farmer's Association (PLFA) & Centre for Excellence for Dairy Skills in India (CEDSI) on November 9, 2023. S. Inderjeet Singh; Director Dairy Development (Retd.), Government of Punjab informed that CEDSI is an autonomous institution committed to dairy skill development in India and aims to ensure sustainability and profitability in the dairy sector through skilling & capacity building, policy advocacy, knowledge management and research.

S. Jaswant Singh Kalsi, Chief Operating Officer; CEDSI explained different market forces affecting dairy business. He talked about various ups and downs in dairy scenario. With the latest know how and communication channels, new dimensions of dairy entrepreneurship are opening up. CEDSI will cater to those needs of its stakeholders.

Giving the key note address Dr JPS Gill, Director of Research of the university; highlighted the challenges & opportunities in dairy development. He reiterated that sufficient green fodder availability through improved varieties is must to thrive in dairy farming. Environment sustainable dairy production and integrated farming should be promoted. More emphasis should be on value addition of milk and extension services.

Dr. Ramandeep Singh Director Business Studies, PAU, Ludhiana pointed three qualities which every stakeholder must possess to be successful in the business i.e. Knowledge, Passion and Fire within. He stressed upon acquiring latest knowhow through various courses and seminars to sustain in the race. He advised the farmers to focus on inputs, storage, transportation, processing, marketing and consumer's choice. Various milk products can be developed if marketing is done through systematically data based analysis.

Dr. Ashwani Kumar Soni, Associate Professor, Department of Renewable Energy, PAU gave a talk on Waste Management and how an entrepreneur can generate income from dung. He discussed various models of gobar gas plants and appealed to every dairy farmer to install such plants so that they can reduce their cost of production and safeguard the environment by Green House Gas (GHG) mitigation.

One of the main diseases affecting dairy animals is Mastitis. It is causing huge losses to the farmers and affecting the quality of milk as well. Dr CS Randhawa, Former Head, Department of Veterinary Medicine explained nicely the causes, symptoms, line of treatments and precautions to prevent such a costly disease. He cleared certain myths regarding the traditional treatment methods applied by the dairy owners. He stressed upon teat cleanliness, milking machine hygiene and dry therapy.

Dr Parminder Singh, Professor Animal Nutrition requested the farmers not to burn paddy straw (PS). He discussed various methods of utilization of PS in the dairy farm. He explained the urea treatment process to improve the utilization of PS and its utilization as cattle feed to make it more economical. By scientific treatment of PS, it can be safely consumed @ 5-7 kg per animal on daily basis.

Sh. Rupinder Singh, President Buffalo Farmer Association; discussed the activities of the organization. He asked every buffalo farmer to participate in the forth coming Buffalo Show. He requested each stakeholder to focus on breeding and genetic improvement in buffalo.

S. Sandeep Singh Randhawa, President PLFA briefed the activities and vision of the association. He also showed concerned about the availability of good quality semen suitable to Punjab conditions. He pointed towards non uniform rates of milk prevailing in different regions of the state. He asked the farmers to explore self marketing avenues.

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ARTICLE

Campylobacteriosis - A Zoonotic Risk

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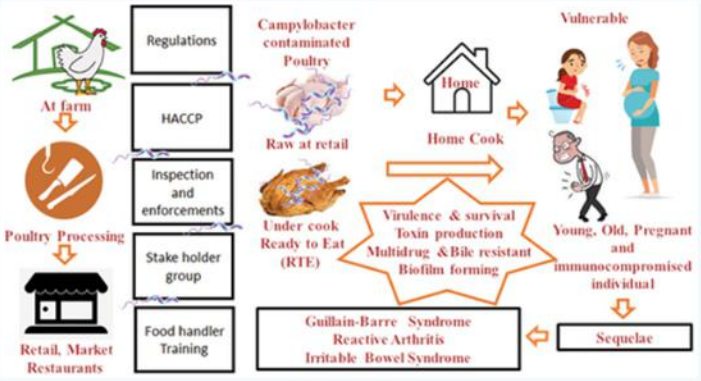
[2]Livesstock Development Officer, Taluka Mini Veterinary Polyclinic, Degloor, Nanded, Maharashtra-431717

Introduction

Campylobacter is the most common cause of bacterial gastroenteritis around the globe. WHO estimated that the incidence of Campylobacteriosis is 1 in 4 causes of gastrointestinal disease in both developed and developing world. Poultry is considered as one of the most important reservoirs of Campylobacter species and represents a very significant vehicle for the transmission to humans. Nonetheless, Campylobacteriosis risk management system is in place at national and international level, so far it has not been possible to cater Campylobacter free poultry to the consumer. Numerous studies have been reported that the incident of food-borne illnesses linked to food handlers. According to the EFSA Scientific Opinion published in 2010, the risk of human campylobacteriosis linked to poultry handling, preparation and consumption accounts for 20 to 30% of human cases of campylobacteriosis. Fig. 1 presents a summary of an overview of human Campylobacteriosis. It is important to educate consumers regarding the severity of Campylobacteriosis and impart knowledge of food safety practices.



Campylobacter spp is a gram-negative microorganism, non-spore-forming, which colonizes the mucosal surfaces of the intestinal tracts, oral cavities, or urogenital tracts of most warm-blooded animals. The species can grow in pH between 6.5 and 7.5 and in temperatures between 37°C and 42°C. Thus, they are considered thermophile and birds have been widely regarded as natural hosts of these organisms. Campylobacter species, particularly Campylobacter jejuni and Campylobacter coli are the most common to cause gastroenteritis in humans. The genus Campylobacter is commonly found in nature and can contaminate drinking water. Among sporadic human cases, contact with live poultry, consumption of poultry meat, drinking water from untreated water sources, and contact with pets and other animals have been identified as the important sources of infections.

Virulence and survival feature

The onset and infection of Campylobacter require several virulence factors including motility, chemotaxis, adherence, and invasion of the host cell, toxin production, structures of the cell envelope, iron uptake system, multi drug and bile resistance, and mechanisms of responses to stress. Additionally, it can also form a biofilm, a polymeric matrix synthesized by aggregates of microbial cells from the same or different microorganisms that are attached to various types of surfaces. These biofilms protect the bacteria from a hostile environment which allows the pathogen to survive. Besides several virulence factors, previous studies reveal that Campylobacter spp are also increasing antimicrobial resistance particularly strains isolated from food. Furthermore, it has not been possible to control the Campylobacter at farm level because it is resistant to various veterinary antibiotics. Thus, it has not been able to provide Campylobacter free poultry to the consumers.

Prevalence of Campylobacter in poultry

Campylobacter spp. have been found in many avian species, both domesticated and wild. Among domesticated birds, a high prevalence of C. jejuni and C. coli is often found in broiler chickens, breeder flocks and egg-laying hens. Thus, poultry is recognised as the major reservoir of Campylobacter infection for humans. The prevalence of Campylobacter in poultry can lead to a greater exposure risk when consumers mishandle raw poultry in the domestic kitchen. Infection in poultry is predominantly through the oral-faecal route or through vertical transmission from parent flocks. The cross-contamination normally passes on to generation to the next from same farm animal and it is very unusual that cross contaminated from environment to the animal.

The chicken meat in retail is tainted with C. jejuni up to 98% of cases in the US and from 60% to 80% of cases in Europe.The highest occurrence of Campylobacter (36.7%) in broiler meat was detected in 2016 reported by Europe. In 2011 nationwide survey on raw chicken on retail sales in the Republic of Ireland (ROI) revealed Campylobacter was detected in 50.2% of samples using a quantitative method, with bacteria counts ranging from of 10 CFU/g, to of 61,000 CFU/g. These high levels of bacteria spreads easily in the environment, especially in a domestic setting with mishandling, thus allowing the contamination further.

Epidemiology

Campylobacteriosis incident occurs in all age groups with the highest rate of notification reported in the 0-5 year and the percentage of people hospitalised and died was highest among persons aged ? 65 years. Common symptoms include mildness such as diarrhoea, abdominal pain, malaise, fever, nausea and vomiting. The illness is self-limiting, the duration of illness lasting from 3 to 6 days to up 10 days. The incubation period is between 2-5 days but may vary from 1 to 11 days. Although diarrhoea is the most common clinical symptom of Campylobacter spp infection, a broad clinical spectrum is associated with this infection, from asymptomatic carriage to systemic illness and bacteraemia to

localised infection and association with many more complications. Recently, the researchers identified that a small proportion of Campylobacteriosis patient developed reactive arthritis shortly after gastroenteritis.

Guillain-Barre Syndrome (GBS)

Uncommon cases of complication can occur at post campylobacteriosis infection, for instance, an acute immune-mediated inflammation of the peripheral nerves known as GBS often resulting in neuromuscular paralysis. In general, most of the GBS patients can fully recover within a few weeks/ months, and do not have any further problems. However, in some cases, it may take longer to recover, and there is a possibility of permanent nerve damage. The incidents of GBS in relation to peripheral nervous system destruction caused by campylobateriosis have been studied globally. Approximately, 40% of GBS cases are associated with post Campylobacteriosis infection.

Campylobacteriosis control relevant to poultry

The control of Campylobacter in the food chain is a tremendous challenge for every stakeholder. It is both the pervasive and the low infective dose required for illness. It is often difficult to detect the origin of exposure to Campylobacter, because of its sporadic nature of the infection and the important role of cross-contamination. Indeed, there is no single control measure approach that can completely eliminate Campylobacter from the food chain, or even reduce to the safe level, without affecting product attributes. Consumers' acceptability of the decontamination method of the poultry meats varies from country to country.In EU, recently amended EU Regulation 2073/2005 has included the maximum permitted level of 1000 CFU/g at the slaughter for the broiler (Commission Regulation (EU) 2017/1495). Although recently amended EU Regulation 2073/2005 has included the maximum permitted level of 1000 CFU/g at the slaughter for the broiler (Commission Regulation (EU) 2017/1495), the infective dose is as low as 500 cells.

Food safety training

Despite, the fact that food safety and nutrition is part of the curriculum of primary and secondary school in the most developed countries.In Ireland 'Social, Personal and Health Education' (SPHE) programme is the curriculum in all Irish primary schools since 2002. In United States, food safety program is in the curriculum as well as additional educational strategies have been employed to improve food safety in elementary and middle school students such as electronic game, Kitchen Ninja to the Rescue. However, the current foodborne illness reports indicate that food handlers' knowledge remained low. In most cases, the knowledge was not always translated into practice. This leads us to suggest that only risk perception and perceived behavioural control are the only make differences in food safety practices.Food businesses across the globe are legally required to have a food safety management system based on the principles of Hazard Analysis & Critical Control Point (HACCP) and have trained the food handlers since 1998. HACCP trainings are mandatory and improved food handler's knowledge and hygiene practices . The training alone is not elixir, the food handlers' knowledge, attitude and practices are required to monitored by Environmental Health Officer (EHO) on their routine inspection of the food businesses . Refresher training is also required to provide upon the EHO's recommendation and or periodically otherwise food safety knowledge of the trained food handlers decline significantly.

Future perspective and conclusion

In conclusion, poultry is the main contributor to human campylobacteriosis and is still one of the most pandemic infectious diseases that is a foreseeable threat to consumers in the years ahead. Countless studies demonstrated that an absolute elimination of Campylobacter in the poultry production chain is not feasible. The Campylobacter tainted poultry remain cross-contaminate from farm to fork. While all the food businesses require legitimately to implement HACCP to mitigate the incidents, it is almost impossible to control particularly in the domestic setting. Which lead to suggest that the integrated effort from all stakeholders in terms of biosecurity at the farm level, effective HACCP at processing along with distribution and ultimately inform the consumer about the risk associated with it. Accordingly, the incident of campylobacteriosis perhaps lowered in human's population. This review provides well-grounded and updated useful information for food industries, health services and public food safety authorities with regards to stepping up the risk communication effort to consumer and advice appropriate mitigation measures. It is noticeable that in order to lower the Campylobacteriosis incident, the development of the strategy to combat is necessary. Such a strategy will establish the appropriate measure to control the Campylobacter from farm to fork. Further research is needed to identify the most efficient channel in risk communication to the consumer.

Pesticides & Their impact on Environment Animal & Human Health

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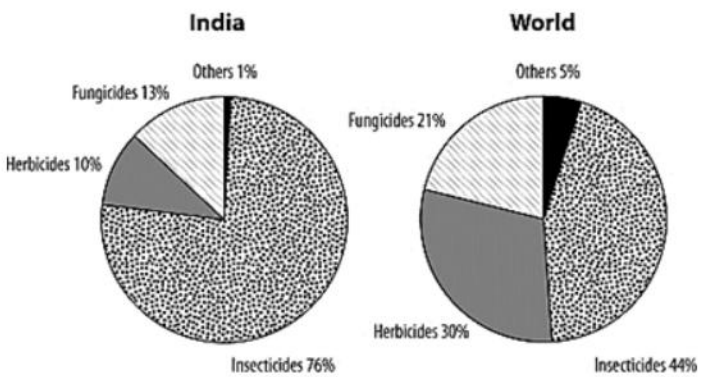
Introduction

As defined by the Environmental Protection Agency (EPA), pesticides encompass a category of chemical compounds employed for the purpose of controlling and repelling pest populations. This group comprises substances or combinations thereof that find primary usage in agriculture and public health initiatives. Their role is to safeguard plants against pests, weeds, and diseases, while also providing protection against vector-borne illnesses like malaria, dengue fever, and schistosomiasis. Various types of pesticides exist, including insecticides, fungicides, herbicides, rodenticides, and plant growth regulators.

Classification of pesticides

- **Based on the pests they control**
  - Insecticides: combat insect growth or survival
  - Herbicides: work against plants, weeds and grasses
  - Rodenticides: against rats and other rodents
  - Avicides: against bird population
  - Fungicides: attack fungi
  - Nematicides: combat nematodes
- **Based on their chemical structure**
  - Organophosphorus: chlorpyrifos and diazinon,
  - Carbamates (carbaryl and aldicarb)
  - Organochlorine (DDT and aldrin)
  - Pyrethrins and pyrethroids (cyfluthrin and cypermethrin)
  - Benzoic acids (dicamba)
  - Triazines (atrazine and simazine)
  - Phenoxyacetic derivatives (2,4-D)
  - Dipyridyl derivatives (diquat and paraquat)
  - Glycine derivatives (glyphosate)
  - Dithiocarbamates (maneb and ziram)

Consumption pattern of pesticides



Aktar et al., (2009)

The utilization pattern of pesticides in India differs from the global trend. As illustrated in the figure, insecticides constitute 76% of the total pesticide usage in India, in contrast to the global average of 44%. Conversely, the application of herbicides and fungicides is comparably lower. Notably, the primary purpose for employing pesticides in India is to protect cotton crops (45%), followed by paddy and wheat cultivation.

Benefits of Pesticides

Pesticides serve several key purposes, which include:

1. **Enhanced Productivity:** Pesticides contribute to improved agricultural output by managing pest populations and minimizing crop losses, thus boosting overall productivity.
2. **Safeguarding Crop Yields:** Pesticides play a pivotal role in shielding crops from yield reduction caused by pests, thereby ensuring optimal harvests.
3. **Vector-Borne Disease Management:** Pesticides are crucial for controlling disease-carrying vectors, helping to prevent the spread of illnesses like malaria, dengue fever, and other vector-borne diseases.

4. **Diverse Applications:** Pesticides find utility in various domains, such as:
    a. Sports Facilities: Herbicides and insecticides are employed to maintain the quality of turf on sports fields, cricket pitches, and golf courses.
    b. Structural Protection: Insecticides are used to safeguard buildings and wooden structures from termites and woodboring insects, averting potential damage.

Impact on environment

- **Air pollution**

Pesticide Drift occurs when pesticides, existing as airborne particles, are carried by the wind to unintended locations, thereby contaminating those areas. Higher wind velocities amplify the occurrence of spray drift and associated exposure. Factors like low relative humidity and high temperatures contribute to increased spray evaporation. Pesticides applied to crops can undergo volatilization, turning into vapor and being carried by winds to neighboring regions, potentially endangering wildlife. Pesticides used for soil fumigation can emit volatile organic compounds, which can react with other chemicals and give rise to a pollutant known as tropospheric ozone.

- **Water pollution**

Pesticides have the potential to contribute to water pollution through various pathways. These include unintended drift during application, percolation or leaching through soil layers, runoff into water bodies, and accidental or negligent spills. Several factors determine a pesticide's capacity to contaminate waterincluding its water solubility, distance from application site to water body, weather conditions, such as rainfall and wind patterns, soil type and its characteristics, presence of a growing crop and application techniques.

- **Soil pollution**

Chemical compounds found in pesticides can persistently linger within the soil, exerting lasting effects that may span decades and pose detrimental effects to soil preservation efforts. Pesticide application contributes to a reduction in overall soil biodiversity and the depletion of organic matter within the soil composition. The persistence of pesticides in soil is influenced by both degradation and absorption processes. Depending on the specific chemical attributes of the pesticide, certain mechanisms directly regulate its movement from the soil to water bodies, subsequently impacting air quality and the safety of our food sources.

- **Effects on soil organisms**

Soil microorganisms play a crucial role in upholding soil integrity, facilitating the conversion and breakdown of organic matter, and facilitating the release of nutrients for plant utilization. While soil microorganisms possess the capacity to metabolize and break down numerous pollutants and pesticides, the latter can exert detrimental impacts on the growth and reproductive capabilities of earthworms. Pesticides disrupt enzymatic functions, elevate individual mortality rates, diminish reproductive capacity and physical growth, alter behaviors like feeding rates, and ultimately lead to a reduction in overall community biomass and population density.

- **Effects on plants**

Pesticides in the soil impede nitrogen fixation, a crucial process for the growth of higher plants. This results in direct negative impacts on plants, including inadequate root hair development, yellowing of shoots, and diminished overall plant growth. When pesticides are applied to flowering crops, it can lead to the mortality of honeybees, vital pollinators responsible for plant reproduction.

Impact on animal health

Pesticide residues left on food can poison animals as these residues move through the food chain. Some animals may face a loss of critical food sources due to pesticide usage, leading them to migrate, alter their diet, or face the risk of starvation. Pesticide exposure can result in weakened immune system responses, reproductive consequences such as decreased birth weight and lower conception rates, as well as neurological and endocrine disruptions.

Aquatic animals, including fish, can face harm when exposed to water contaminated with pesticides. Repetitive contact with sub-lethal amounts of certain pesticides can induce alterations in physiology and behavior among fish, leading to population declines, abandonment of nests and offspring, lowered disease resistance, and compromised evasion from predators. Pesticides can accumulate within water bodies to levels that result in the eradication of zooplankton, a primary food source for juvenile fish.

Impact on human health

Pesticides can infiltrate the body through various pathways: inhalation of aerosols, dust, and vapor; ingestion via food and water; and skin contact through direct touch.The impact of pesticides on human health depends on both the toxicity of the chemical and the duration and intensity of exposure.Children, due to their ongoing development and weaker immune systems compared to adults, are more vulnerable and responsive to the effects of pesticides.Adverse health effects encompass a range of symptoms such as headaches, fatigue, respiratory ailments, cardiovascular issues, gastroenteritis, and skin irritation, among others.Pesticides have also been linked to developmental anomalies. The consequences of exposure can vary from mild skin irritation to birth defects, tumors, genetic alterations, blood and nerve disorders, disruptions in the endocrine system, and even extreme outcomes like coma or fatality.

Conclusions

A practical stance is essential when dealing with pesticide utilization. This implies that all actions related to pesticides must be based on scientific assessment rather than driven solely by commercial motives. It is imperative to provide education and training to workers to ensure the safe and proper application of pesticides. Monitoring the residual levels of pesticides in body fluids and tissues of the general population serves as a valuable means of gathering information about the ultimate outcomes of human exposure.

अधिक दुग्ध उत्पादन हेतु गर्भित एवं नवजात पशुओं की देखभाल एवं प्रबन्धन

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**सहायक प्राध्यापक, पशुधन प्रक्षेत्र विभाग, पशुचिकित्सा विज्ञान एवं पशुपालन महाविद्यालय
***प्राध्यापक, पशुधन उत्पादन एवं प्रबंध विभाग, पशुचिकित्सा विज्ञान एवं पशुपालन महाविद्यालय
आचार्य नरेन्द्र देव कृषि एवं प्रौद्योगिक विश्वविद्यालय, कुमारगंज–अयोध्या (उ॰प्र॰)

गर्भावस्था में पशुओं की देखभाल अन्य पशुओं की अपेक्षा अधिक करनी पड़ती है। गर्भित होने के पश्चात् एक गाय लगभग 9 महीने 9 दिन तथा भैंस 10 महीने 10 दिन में बच्चा देती है। पशु के गर्भित होने से लेकर ब्याने तक सामान्यतः निम्नलिखित सावधानियाँ रखनी चाहिये।

- गर्भित पशु को शान्त वातावरण में रखा जाऐ।
- पशु को केवल आवश्यक साधारण व्यायाम ही कराया जाए, न उसे दौड़ाया जाए न अन्य पशुओं द्वारा उसे परेशान किया जाए।
- गर्भित पशु को नियमित रूप से अच्छे चारागाह में भेजा जाए।
- ब्याने की अनुमानित तिथि से 2 माह पूर्व से पशु का दूध लेना बन्द कर देना चाहिये तथा उसके दाने में वृद्धि कर देनी चाहिये, यह वृद्धि दूध देते समय की आधी होनी चाहिये।
- दाना सुपाच्य एवं स्वादिष्ट होना चाहिये, भीगा या चिपचिपा नहीं।
- एक गर्भित गाय/भैंस को साधारणतया 30–35 कि॰ग्रा॰ हरा चार, 3–4 कि॰ग्रा॰ सूखा चार (भूसा इत्यादि), 2–3 कि॰ग्रा॰ दाना एवं 50 ग्राम नमक प्रतिदिन दिया जाना चाहिये।
- यदि पशु को मुख्य रूप से सूखे चारे पर रखना है तो उसे 5–8 कि॰ग्रा॰ भूसा और 5–10 किग्रा0 हरा चारा दिया जाना चाहिये।
- वर्षा ऋतु में लोबिया + मक्का का हरा चारा अथवा लोबिया + ज्वार की कुट्टी का मिश्रण उत्तम रहता है।
- ब्याने के लगभग 6 सप्ताह पूर्व पशु की विशेष खिलाई–पिलाई आवश्यक होती है।
- पशु के ब्याने के 15 दिन पूर्व उसे अन्य पशुओं से अलग कर दिया जाना चाहिये।
- जिन पशुओं के ब्याने के पूर्व दूध उतर आता है उन्हें ब्याने के पहले नहीं दुहना चाहिये, इससे गर्भकाल बढ़ जाता है तथा ब्याने की प्रक्रिया कष्टकारी हो सकती है।
- पशु को ब्याने के समय शान्त वातावरण में स्वच्छ एवं बिछावनयुक्त स्थान में रखना चाहिये।
- पशु को यथा सम्भव प्रतिकूल मौसम से सुरक्षित रखना चाहिये।
- ब्याने के पश्चात बछड़े की नाल को काट कर उस पर टिंक्चर आयोडीन लगा देना चाहिये।

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- शिशु को गुनगुने पानी में भीगे हुए तौलियो से साफ करना चाहिये।
- नवजात शिशु के नथुने एवं मुँह को साफ करके कोलस्ट्रम पिलाना चाहिये।
- ब्याने के 2–4 घण्टे के पश्चात् जेर स्वतः निकल जाती है किन्तु यदि 8 घण्टे तक भी जेर स्वतः न निकल तो उसे निकालने के उपाय करने चाहिये।
- जेर निकलने पर इस बात का ध्यान रखना चाहिये कि उसे पशु खा न ले, जेर को गहरे गड्ढे में गाड़ देना चाहिये।
- ब्याने के स्थान (Calving pen) की सफाई फिनायल के घोल से समुचित रूप से करनी चाहिये।
- अधिक दूध देने वाले (Heavy yielder) पशुओं से एक बार में पूरी खीस (कोलस्ट्रम) न निकालें बल्कि थोड़ा–थोड़ा करके दिन में 3–4 बार निकालें। एक बार में पूरी खीस निकालने से मिल्क फीवर की आशंका होती है।
- तुरन्त ब्याये हुए पशु को गेहूँ का दलिया, गुड़, सोंठ एवं अजवाइन आदि मिलाकर हल्का पका कर खिलाना चाहिये।
- पीने हेतु गुनगुना पानी इच्छानुसार देना चाहिये।

गर्भावस्था में आहार व्यवस्था

- गर्भित गाय के निर्वाह एवं उत्पादन के ऊपर एवं भ्रूण के विकास हेतु (गर्भित होने के 5–6 माह बाद) 0.14 किलो पाचक प्रोटीन (D.C.P.), 0.7 कि॰ग्रा॰ सम्पूर्ण पाचक तत्व (T.D.N.), 12 ग्राम कैल्सियम, 7 ग्राम फास्फोरस तथा 30 मि॰ग्रा॰ विटामिन 'ए' मिलना चाहिये।
- उपरोक्त आवश्यकता 1.5 किग्रा0 अच्छा पौष्टिक मिश्रण देने से पूरी हो जाती है एवं साथ में दाने में 2 प्रतिशत कैल्शियम कार्बोनेट और मिला दिया जाता है।
- यदि इस अवधि में गाय दूध दे रही हो तो उसका दूध सुखा देना चाहिये।
- गर्भित गाय के ब्याने के एक या दो सप्ताह पूर्व चोकर तथा अलसी की खली दे कर दाने की मात्रा बढ़ा देनी चाहिये।
- पशु के ब्याने के पश्चात् तुरन्त कार्बोहाइड्रेट युक्त चारा खिलाना चाहिये।
- ब्याने के पश्चात् 3–4 दिन तक तैलीय खली (Oil Cakes) नहीं देनी चाहिये।
- दाने की मात्रा धीरे–धीरे बढ़ानी चाहिये जिससे एक या दो सप्ताह में पशु अपनी आवश्यकतानुसार अधिक से अधिक दाना खा सके। बाद में पशु को निर्वहन एवं उत्पादन आवश्यकता से ऊपर लगभग 0.5 कि॰ग्रा॰ सम्पूर्ण पाचक तत्व (T.D.N.) प्रतिदिन और देना चाहिये।
- ब्याने के बाद गर्भाशय की सफाई के लिये पशु को औटी दी जा सकती है न कि जौ का आटा या अरहर की दाल।
- पशु को संतुलित चारा ही दिया जाए।

नवजात शिशुओं की आहार व्यवस्था

- जन्म के पश्चात् प्रथम 3 दिन तक खीस पिलानी चाहिये, खीस में विटमिन 'ए' तथा एण्टीबॉडीज होते हैं जिनसे बच्चों की विभिन्न बीमारियों से रक्षा होती है।
- यदि किसी कारणवश खीस उपलब्ध न हो तो 1/2 चम्मच आरण्डी का तेल, 1/2 पिंट में फेंटा हुआ एक अण्डा, एक पिंट गर्म दूध मिलाकर पहले 3 दिन तक दें, इसे दिन में 3 बार तक दिया जा सकता है।
- 1 से 2 माह तक के बछड़े को उसके शरीर के 10वाँ भाग की मात्रा में दूध पिलाना चाहिये। प्रारम्भ से लगभग 2.5 लीटर दूध देकर दूसरे माह में 3.5 लीटर दूध पिलाना चाहिये।
- 2 माह के पश्चात् धीरे–धीरे सम्पूर्ण दूध के स्थान पर सेपरेटेड मिल्क देना चाहिये।
- ऊर्जा पूर्ति के लिये 1 माह की आयु से ही थोड़ा–थोड़ा पौष्टिक मिश्रण, पूरक आहार के रूप में देना प्रारम्भ कर देना चाहिये।
- दाने की मात्रा 1 मुट्ठी से प्रारम्भ कर धीरे–धीरे बढ़ानी चाहिये जिससे 6 माह में यह 1.5 कि॰ग्रा॰ तक पहुंच जाये।
- चौथे माह से सेपरेटेड मिल्क कम कर देना चाहिये।

बछड़े के लिये पौष्टिक मिश्रण

जै, जई या मक्का (दला हुआ)	–	45 भाग
मूंगफली की खली	–	35 भाग
चोकर	–	17 भाग
खड़िया	–	2 भाग
नमक	–	1 भाग

- छोटे बच्चों को तामचीनी के तसले में दूध पिलाना चाहिये।
- पैदा होने के प्रथम 2 सप्ताह तक बछड़े को दिन में 3–4 बार दूध पिलाना चाहिये।
- बछड़े को कम से कम 5 दिन तक सम्पूर्ण दूध पिलाना चाहिये।
- विटामिन की कमी को पूरा करने के लिये मछली का तेल पिलाया जा सकता है।
- यदि दुग्ध परिवर्तन काल में बछड़े को दस्त आने लगें तो उसे 24 घण्टे भूखा रख कर उबाला हुआ पानी + 2 औंस आरण्डी का तेल पिलाना चाहिये तथा आवश्यकतानुसार एंटीबायोटिक या सल्फाड्रग्स भी देनी चाहिये।
- बछड़ों के आहार में एकाएक परिवर्तन नहीं करना चाहिये, यह परिवर्तन क्रमिक होना चाहिये।

Scientific Feeding of Buffalo for Improved Reproductive Performance

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Reproductive performance is a very important economic trait in dairy buffalo. Reproductive inefficiency results in increased calving intervals, increased involuntary culling rates, decreased milk production, and delayed genetic progress, among other problems, causing significant economic losses. Optimizing reproductive efficiency depends upon the successful completion of the following events: (1) a heifer must reach puberty before the start of the breeding season. Replacement heifers, as unproductive animals, should be considered as a cost. Thus the quicker the age at first calving, the quicker the return on investment. (2) must conceive early in the breeding season. (3) must calve unassisted. (4) the calf must survive to the time it is marketed, and (5) the heifer/cow must conceive in time to calve early during the subsequent calving season. Nutrition plays a pivotal role in maintaining the body condition and reproductive efficiency of dairy animals. Nutrient either in deficient or in excess amount has been shown to be capable of altering reproductive efficiency. One possible strategy that could be employed to improve reproductive efficiency within the dairy industries is nutritional manipulation. Therefore, improved reproductive efficiency should be a management focus as it is the main driver for commercial dairy husbandry.

Energy: The most important nutritional factor affecting reproduction in dairy buffalo is the energy intake. Energy status is a primary driver of optimum reproductive performance. If animal is in a negative energy balance, their chances of reproductive success are low. Inadequate energy intake in heifers will lead to delay in sexual maturity. Negative energy balance (NEB) is a common feature in high yielders during early lactation because of inadequate intake of energy due to reduced feed intake and mobilization of body fat reserves to meet its energy demand for high levels of milk production. Indeed, supplementation to improve or maintain energy balance is undoubtedly critical for optimum reproductive performance. Energy stores in body tissues are mobilized and weight losses occur, resulting delayed oestrus and conception. The mobilisation of body fat due to low levels of blood glucose causes increased blood levels of non-esterified fatty acids (NEFA) and ketone bodies like acetoacetate, acetone and -hydroxybutyrate (BHBA). At the same time, blood levels of growth hormone (GH) are increased and that of insulin and IGF-1 are decreased. These metabolic changes are negatively associated with fertility. They include disturbances in LH pulse frequency, growth rate and diameter of the dominant follicle, weight of the corpus luteum, and progesterone and oestradiol concentrations. Increased NEFA concentrations in blood have been linked to greater incidences of ketosis, displaced abomasum, retained placenta and altered blood metabolites and hormone profiles. Proper feeding management can help to prevent the animal from NEB, resulting in improvement the production and reproduction of the animals. Fatty acids and cholesterol act as the substrates for reproductive hormone synthesis. Increasing fat in the diet may increase levels of reproductive hormones. Potential improvements in fertility with supplemental fat have generally been associated with increased dominant follicle diameter, improved oocyte and embryo quality. The level of total dietary fat in ration should not exceed 6-7% of diet. Mixture of cereal grain and forages usually contain about 3% fat, so up to 3 or 4% of dietary DM may come from supplemented fat. A number of studies have revealed that dietary supplementation of bypass fat in crossbred cows and Murrah buffaloes improved the milk yield and fat content. In buffaloes, about 100-150 g bypass fat per day could be supplemented to increase milk production performance. Supplementation of bypass fat at 2.5% of DMI resulted in increased birth weight of the calves, while time taken for expulsion of foetal membranes, involution of uterus, onset of cyclicity, the service period and number of inseminations per conception were reduced ($P<0.05$) in supplemented group. Increase in milk fat and yield was also reported in buffalo while supplementation of 15g bypass fat per kg milk yield, however, there was no effect on cyclicity and pregnancy rate.

Protein: Protein is vital to the maintenance, reproduction, growth, and lactation of animals. Low level of dietary protein severally affect rumen microbial growth and fermentation resulting in increased retention time of nutrients, decreased capacity to digest organic matter and depressed feed intake which affect animal performance. Holstein cows fed a 23.1% CP diet exhibited a 22% lower pregnancy rate when compared to the other group fed a 17.7% CP diet. When fed in excess, protein is utilized as source of energy especially in cases of energy shortage, since deposition of protein in reserve tissues of ruminants is limited to the extent of 8-22% of total body protein. Inefficiencies arise from elimination of surplus urea, which in turn increases energy requirement and may affect health and reproduction of the animals. Rumen microbial activity for efficient forage utilization is hampered when diet contains less than 7% CP. However, reproductive efficiency may be impaired if a protein is fed in excess amount of the requirement. Negative association between high dietary CP and fertility parameters was reported. Excessive feeding of protein during the breeding season and early gestation, particularly when the rumen receives an inadequate supply of energy, may be associated with reduced fertility. This decrease in fertility may result from decreased uterine pH during the luteal phase of the oestrous cycle in animal fed high levels of degradable protein. Animals fed 10-15% excess protein above the requirement involve more services per conception and had longer calving intervals. Supplementation of 15-19% excess CP resulted in lowered conception rate from 65 to 53%. The negative effects of protein supplementation are associated with an increase in blood urea-N, which affects ovarian follicular and embryo development. Successful embryo development depends upon the nature of the uterine environment, while increased urea level can decrease the uterine pH that would negatively affect the implantation and development of embryos, mostly at the cleavage and blastocyst formation stage. Higher serum urea levels because of excessive CP intake and poor body condition due to lower energy intake were the key factors for inferior reproductive efficiency in Nili-Ravi buffaloes.

Minerals:

Macro minerals

Ca deficiency is common during parturition or within few days following parturition. The Ca:P ratio imbalance may affect ovarian function resulting in prolongation of first oestrus and ovulation, delayed uterine involution, increased incidence of dystocia, retained placenta and prolapse of uterus. Low Ca level in blood is associated with anoestrus and excess of Ca may affect reproductive health of animal by impairing absorption of P, Mn, Zn, Cu and other elements. Ca:P ratio between 1.5:1 and 2.5:1 for lactating animal should be maintained. Dry animals should be provided with optimum levels of Ca and P to decrease the incidence of milk fever which is important for maximizing reproductive efficiency. Ca present in the seminal plasma of buffalo bulls plays an important role in preserving spermatozoa motility and viability, as well as antioxidant status by protecting the sperm cells oxidative damage. P deficiency is associated with reduced production performance, abnormal sexual behaviour resulting in decreased fertility rate, feed intake, milk production, decreased ovarian activity, delayed sexual maturity and low conception rates in dairy animals. Delayed attainment of puberty, silent or irregular estrus in heifers, failure of estrus, long inter-calving period, still birth or weak calves or even embryonic death due to lack of uterine muscle tone are reported to be some of important clinical manifestations by the animals on P deficient diet and the excess of P renders the endometrium susceptible for infection. P is also needed for the maintenance of glycolysis and motility. The P concentration detected in the seminal plasma of bulls was positively correlated with quantity and quality parameters of semen. Na and K are responsible for maintaining osmolarity and activity of spermatozoa and regulate sperm motility and the acrosome reaction. Mg is required for capacitation, hyperactivation and acrosome reaction of spermatozoa in male reproduction. Mg level in the seminal plasma increases with sperm concentration but has no significant bearing on sperm motility, however, positive effects of Mg on the motility, morphology and concentration of spermatozoa were reported. Mg content in the seminal plasma was positively associated with the total antioxidant status of semen. Sulphur containing compounds increased the mobility and survivability of the cryopreserved spermatozoa.

Micro minerals: Mn deficiency results in delayed estrus, reduced conception rate and deformed calves. Cu deficiency in ruminants is associated with delayed or depressed estrus, long post-partum return to estrus period; anoestrus, silent heat, abortion and fetal resorption. Cu rich diets enhance spermatozoa motility and it may also act on the pituitary receptors which control the release of luteinizing hormones (LH). Cu deficient or excess levels may affect spermatocytogenesis with regard to sperm production, maturation and fertilizing capacity. Excess feeding of Mo resulted in decreased libido, reduced spermatogenesis and sterility in males and delayed puberty, reduced conception rate and anoestrus in females. Cobalt deficiency causes reduced fertility and increased early calf mortality. Depletion of cobalt at parturition results in decreased milk production. Semen contains a certain amount of Fe, required for a normal spermatozoa production and functions. The total Fe content of the buffalo seminal plasma was highly associated with sperm motility and viability. Fe content within the seminal plasma is important for the preservation of sperm motility and viability after ejaculation, and its presence will help spermatozoa to maintain their functions. Increased Fe concentration can affect negatively the morphology and DNA integrity of spermatozoa. Zn is essential for sexual maturity and early attainment of puberty. Seminal Zn has an important role in the physiologic functions of the sperm cell and that its reduced levels result in low seminal quality and subsequent chances of fertilization. Severity of udder edema increased when heifers were fed NaCI (23 or 136 g/d) or KHCO3 (0 or 272 g/d) in the diet but not when both salts were added together. Alteration of dietary cation-anion difference by addition of Cl may effectively reduce incidence and severity of parturient hypocalcaemia.

Vitamins: Vitamins C, D, E and B-complex are either synthesized by rumen microorganisms, by the animal body or available in most common feedstuffs. Vitamin A, is deficient in mature forages, crop residues, and other poor quality forages. The deficiency of which definitely plays an important role in embryonic development and its supplementation before and after calving may increase conception rate. Vitamin A deficiency in dairy animal result in delayed sexual maturity, abortion, birth of dead or weak calves, retained placenta and metritis. Dairy animals and heifers consuming diets deficient in ?-carotene suffered delayed uterine involution, first estrus after calving, or ovulation and increased incidence of cystic ovaries. Buffalo requires vitamin A or its precursor ?-carotene in its diet. Daily feeding of 2-3 kg green generally meets the requirement of vitamin A. When no green fodder is available, lactating buffalo should be supplemented with vitamin A (20000 to 45000 IU/d) and growing buffalo should be fed 2000 to 8000 IU/d. Vitamin E supplementation at 1,000 IU from 30 to 60 days postpartum decreased postpartum estrus interval, days open and services per conception suggesting that the supplemental dose might be reduced from 1,500 IU to 1,000 IU from 30-60 days postpartum in buffaloes. Generally, there is no need for supplementing other vitamins to adult buffalo.

Nutrition associated disorders affecting reproductive efficiency of animals:

Ketosis and fatty liver: Fatty liver and ketosis is a common metabolic disease of lactating animals occurring during the first 10-60 days post-calving. The three-week period after calving seems to be the most critical time of lactating animals and disease occurs during periods when blood non-esterified fatty acid (NEFA) concentrations are elevated. Liver uptake of NEFA is proportional to blood concentration. NEFA can be esterified or oxidized in liver mitochondria or peroxisomes and the product is triglyceride. In ruminants, export of triglyceride from the liver, as part of very low density lipoproteins, occurs at a very slow rate compared to other species. Incomplete oxidation of NEFA leads to formation of ketones: acetoacetate and beta-hydroxybutyrate. Ketonemia is common at calving during the sudden surge of NEFA, when energy requirement for milk production far exceeds the energy intake, and as a secondary disorder that may cause depression in feed intake and elevated NEFA. Many reproductive disorders like delayed involution of uterus, retention of placenta, onset of estrus are associated with elevation of NEFA and ketone bodies.

Milk fever: Milk fever is mainly a problem of older, third to sixth lactation, high-producing dairy animals. It is associated with parturition, usually within 72 h of giving birth. Almost all animals experience some decrease in blood calcium (hypocalcaemia) during the first day postpartum. Animals fed diets that are relatively high in K or Na is in a relative state of metabolic alkalosis which increases the risk for occurrence of milk fever. Adding anions reduced metabolic alkalosis and induced mild metabolic acidosis. Chloride salts are more acidogenic than sulfate salts. Feeding of Mg (0.35-0.40%) in prepartal rations prevents a decline in blood Mg level at parturition. P requirement are met by feeding 40-50 g per animal per day. Feeding of less than 25g of P per day may lead to a downer cow syndrome. More than 80g may induce milk fever. The optimal prepartal dietary Ca concentration is not well defined but very high Ca (>100g) may reduce feed intake and animal performance.

Udder Oedema: Udder oedema is a peri-parturient disorder characterized by excessive accumulation of fluids in the intercellular tissue spaces of the mammary gland. Incidence and severity are greater in pregnant heifers than in adults, and tend to be more severe in older than in young heifers. Excessive intakes of Na and K were implicated as causative agents in udder oedema. K fertilization to increase forage production could be the cause of increased udder oedema. The reduction of udder oedema by CaCl2 was most prominent during the first week of feeding. Oxidative stress of mammary tissue resulting in reactive oxygen metabolites may play a role in udder oedema. A diet must supply adequate vitamin E; Cu, Mg, Zn, Mn and Se to reduce the risk of udder oedema.

Retained placenta (RP) and metritis: RP is a failure of the fetal membranes to be expelled within 12 to 24 h after parturition. Metritis, an inflammation or infection of the uterus, is often associated with RP. Multiple physiologic and nutritional factors have been associated with causes of RP and metritis. Nutritional factors of RP are primarily due to the diet fed 6-8 weeks before calving. Extreme deficiency of dietary energy, protein or both can result in RP. Animals fed diets low in dietary CP (50%) of RP compared with cows fed 15% CP (20% incidence). Fat cow syndrome is also frequently associated with increased incidence of RP and metritis. The rate of RP is associated with imbalances in Ca and P metabolism.

Feeding strategies to improve reproductive efficiency of buffaloes:

Feeding of buffalo heifers: Calves from 6 months of age to adult can be reared on roughage based diet with minimum amount of concentrates. Ration containing 12% CP and 60% TDN (10 kg green fodder, ad lib straw and standard concentrate mixture containing 20% CP and 70% TDN (maize, 30 kg; GNC, 30 kg; wheat bran, 38 kg; mineral mix, 2 kg; salt, 1 kg per 100 kg) @ 1.5, 2.0, 2.5 and 3.0 kg per day for 100, 150, 200, 250 kg BW will provide an average daily growth of 500g. Scientific feeding is required for optimum growth, as buffalo heifers attain puberty when threshold body weight is about 60% of mature weight. With proper feeding, buffalo heifers attain puberty at the age of 17-21 months with a body weight of 270-300 kg. However, very high plane of energy nutrition inhibits development of milk secretary tissue in mammary gland, which reduces lifetime milk production ability.

Feeding of pregnant buffalo: Buffaloes should be fed to support 750-900g average daily weight gain during last 2 month of pregnancy and about 700g average daily weight gain during the last 3 month of pregnancy. In pregnancy of adult buffalo, CP requirement increases by 3, 8.4, 16, 26, 43 and 64% of maintenance requirement on 5th, 6th, 7th, 8th, 9th and 10th month of pregnancy, respectively. The corresponding increases in TDN requirements are 4.3, 7.2, 18.8, 22.2, 39.0 and 67.4% of maintenance requirement, respectively. Pregnant buffaloes should be dried at least 2 month before expected date of calving

Feeding of lactating buffalo: Dietary energy is the most limiting factor in milk production. Lactating buffalo should be fed sufficient nutrients for their milk production and maintenance. Milk production increases gradually, reaches peak at 42- 56 days after calving, and the peak is maintained for next 70 days. It declines gradually thereafter from 126 to 305 days. Inadequate energy intake in early lactation leads to loss of body weight and delay in initiation of post calving oestrous cycle. By and large, ovarian cycle ceases when buffalo looses 15 to 24% of BW. Thus, utmost care should be taken so that they are not underfed during early part of their lactation. The lactating buffaloes in their first and second lactation continue to grow and thus additional 20 and 10% of maintenance requirement should also be provided in first and second lactation, respectively. For a buffalo of 450 kg producing 10 kg milk; 5.0 kg concentrate mixture, 7 kg straw and 20 kg legume fodder/40 kg cereal fodder per day should be fed depending on the availability. For every 50 kg increase or decrease in BW, 350g grain+ 1 kg straw+ 3 kg berseem + 2.5 kg cereal fodder has to be added or reduced, accordingly.

Feeding of breeding buffalo bulls: Breeding bulls should be fed good quality balanced ration for proper development of testicular tissue and improved semen quality. They should attain about 400 kg BW at 30 months of age. They should also be fed good plane of nutrition as low protein diet could delay puberty by 5-6 months with poor testicular development and small semen volume. Maintenance level feeding of bulls without energy allowance resulted in reduction in sperm numbers by 32 and 41% as compared to those receiving twice and thrice maintenance requirements. Therefore, breeding bulls should be fed 100% higher CP and 20% higher energy than maintenance requirement of mature female buffaloes.

Buffalo remains underfed due to poor availability of nutrients particularly protein as tropical forages get lignified. Under nutrition results in the loss of body weight and body condition, delays the onset of puberty, increases the post-partum interval to conception, interferes with normal ovarian cyclicity by decreasing gonadotropin secretion and increases infertility. The major reproductive factors in buffalo husbandry which contribute to low income of the farmers are delayed puberty, long calving intervals, short productive life and high calf mortality. The level of the excess, deficiency or imbalance of nutrients affecting reproduction is not very lucid. Optimum feeding as per requirements of energy, protein, vitamins and minerals is pre-requisite for achieving optimum reproductive efficiency in buffaloes. Improving reproductive efficiency in dairy animals is essential to continually improve milk production to meet the growing global demand for animal food products. In dairy operations, the goal is to produce one healthy calf per cow per year. Therefore, the nutritional factors influencing reproductive efficiency are an area of research for increasing life time productive performance of dairy animals.

Importance of Organic Livestock Production: Global Scenario

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Abstract

The four principles of organic agriculture are health, ecology, fairness and care. Organic livestock farming relies on organic and biodegradable inputs; therefore, health-conscious people are looking for environmentally safe and chemical residue free healthy food. It also ensures animal welfare and sustainability. It can be accomplished by providing organically grown food, access to pasture, shelter, vaccination and stress free environment to the animals. It is based on some basic standards, certifications and proper record keeping. In recent years, organic products have become a major commodity of export and import between different countries of the world.

Introduction

According to a recent report by organic giants FiBL and IFOAM-Organic Internationals, 191 countries of the world today are involved in organic activities. In fact, organic farmland now covers an area of more than 76.4 million hectares. This suggests that many farmers in the world are aware about the organic farming and its importance. The global organic food market size was valued at USD 178.4 billion in 2021 and is expected to be worth around USD 497.3 billion by 2030, growing at a compound annual growth rate (CAGR) of 12.06% during the forecast period 2022 to 2030. Likewise, organic livestock products are also becoming a major commodity of global organic food market. It consists of organically produced dairy products, meat, eggs and some other products. Health concerns, environmental and sustainability issues are the main reasons for emergence of the organic farming (Panday, 2012). Organic farming is a holistic production management system which promotes and enhances agroecosystem 'health' including biodiversity, biological cycles and soil's biological activity.Organic livestock farming relies on organic and biodegradable inputs like organically grown food for animals, good management practices, animal housing and breeding (animals should not be caged, tethered or confined in buildings, clean bedding etc.). Synthetic inputs like chemicals, drugs, antibiotics,and feed additives should be avoided as much as possible in organic livestock farming (Chander et al., 2010). According to IFOAM (2000) the end goal of organic farming is sustainability which includes social, economic, ecological components and social justice and social rights that are integral part of organic farming.In organic livestock farming, animals are reared on loose housing or free range system to limit stocking densities, potentially promoting good foot and hoof health.

Why Organic Livestock farming and Production?

Chemical fertilizers, antibiotics, various drugs and other feed additives may become the part of food chain that may deteriorate the health of the consumers. Therefore, health conscious people are looking for environmentally safe and chemical residue free healthy foods. Organic farming principles also ensure animal welfare as they are based on providing unlimited access to natural conditions to the animals. In simple words it can be said that organic livestock production promotes good health, animal welfare, sustainability and environment friendly practices. Organic livestock production focuses on cultural, biological and mechanical methods to ensure environmentally safe and chemical residue-free foods, along with high animal welfare standards (Codex Alimentarius Commission, 2007). Various comparative studies have shown that incidences of clinical mastitis and ketosis are less on organic farms (Hardeng and Edge, 2001; Valle et al., 2007). Emissions of CO2 and nitrous oxide are lower in organic systems due to the absence of synthetic fertilizer, lower nitrogen application levels and a relatively low use of concentrates. Organic production ensures traceability of the products and organic certification guarantees not only the quality of the product but also the quality of the production process. Excreta and faecal matters of livestock can be used as manure and pesticides, this will reduce the dependence of farmers on chemical fertilizers and other synthetic substances. Organic livestock farming maintains health and welfare of the animals. It also plays a significant role in providing benefits regarding health of the consumers, profit to producers and sustainability of the environment. The organic products fetch a handsome amount of money in international and national market. Organic livestock farming reduces the chances of spreading of disease organisms, dioxins and various other pollutants and synthetic substances in the food chain. Organic foods are poison and chemical residue free as there is no use of synthetic inputs like antibiotics, feed additives, chemical fertilizers, pharmaceuticals, pesticides and herbicides etc. (Pathak et al., 2002). Organic production does not require expensive inputs. Fodders for the animal are to be grown on farm itself. The organic products have added value as consumers are ready to pay higher prices for organically grown food (Badertscheret al., 1998; Grueff, 1998). Organically reared animals produce less methane due to low stocking densities and more use of roughages. In organic farms most of the activities are performed manually so there are more employment opportunities. Organic livestock production promotes food security as it demands less inputs so it make farmers self-sufficientto produce healthy food.Therefore, all these advantages make organic livestock farming and production a good option.

How to Accomplish Organic Livestock Production?

Organic farming is regulated by some well-defined standards and certifications. It demands high quality standards during the entire production process. The basic standards for organic farming are formulated by IFOAM, having over 700 affiliates in more than 100 countries of the world.

In India, Agricultural and Processed Food Products Export Development Authority (APEDA) administers National Programme on Organic Production (NPOP). In organic livestock production at least 80% of the feeds and fodders should be grown organically without the use of chemical fertilizers, pesticides and insecticides. Instead of antibiotics and chemical drugs, herbal preparations should be used for the treatment of the animals. Animal welfare is a key aspect in the organic livestock production, therefore, animals should be reared in free range system and better management practices and good bedding should be provided to the animals. Livestock must be raised under continuous organic management from the last third of gestation. Fresh air, shelter and stress free conditions should be provided to the animals. Access to the pastures should be provided to the animals. Their manure can be used for the production of crops. Vaccination can be done in the animals. In organic livestock production, the species or breeds which are disease resistant and tolerant to harsh climatic conditions of a particular region should be selected (Chander et al. 2010).Farmers or producers should maintain proper record of all the activities involved in organic production as this is essential for the certification and traceability of the organic livestock products. Animals must obtain a minimum of 30% dry matter intake from grazing pasture during the grazing season. At least 60% of the dry matter in daily rations is to consist of roughage, fresh or dried fodder or silage.Synthetic amino acids, growth promoters and feed additives are not to be used in organic livestock farming. The maximum number of livestock density is limited to two livestock units per hectare.

Organic Livestock Farming in India

After the independence, the first five year plan was agriculture oriented. India was facing scarcity of food grains in the initial decades of post-independence era. There were no enough food grains to feed the growing population. So green revolution was started in 1960s under the guidance of M. S. Swaminathan. It was based on use of High Yielding Variety (HYV) seeds, chemical fertilizers, pesticides, insecticides and weedicides etc. for crop production. It resulted in surplus production of food grains. India not only became a self-sufficient nation in the production of food grains to feed its growing population but also exported food grains to other countries. But excessive use of chemical fertilizers and pesticides degraded the soil composition, soil fertility and the environment (Guruswamy et al., 2010). These chemicals also became the part of food chain and deteriorated the health of consumers(Sharma et al., 2009). In such conditions, organic farming became popular as it attracted health conscious people and environmentalists. The Organic Farming Association of India (OFAI) was set up in 2002 in Bangalore.

As per the available statistics, India's rank 6th in terms of world's organic agricultural land and 1st in terms of total number of producers as per 2021 data (FiBL and IFOAM, 2023). The APEDA, Ministry of Commerce and Industries, Government of India is implementing the National Programme for Organic Production (NPOP). The programme involves accreditation of certification bodies, standards for organic production, promotion of organic farming and marketing etc. As on 31st March, 2023 total area under organic certification process (registered under National Programme for Organic Production) is 10.17 million hectares (2022-23). This includes 53,91,792.97 hectares cultivable area and another 47,80,130.56 hectares for wild harvest collection. Among all states Madhya Pradesh has covered largest area under organic certification followed by Maharashtra, Gujarat, Rajasthan and Odisha etc. Uttarakhand is the pioneering state in organic agriculture, since it is the first tate declared as organic because it follows all organic practices although by default (Subrahmanyeswari, 2007). India produced around 2.9 million MT (2022-23) of certified organic products including organic livestock products (APEDA, 2023). The total volume of export during 2022-23 was 3,12,800.51 MT (APEDA, 2023). The organic food export realization was around INR 5,525.18 Crore (708.33 million USD). Organic products are exported to USA, EU, Canada, Britain, Switzerland and Turkey etc. (APEDA, 2023). India has emerged as the largest producer of milk with 22.76% share in total milk production in the world in 2021. India accounts for about 7.25% of the global egg production in 2021. India has the largest population of milch animals in the world. India's exports of animal products in 2022-23 was Rs. 32,597.39 Crores/ 4,062.15 million USD (APEDA, 2023). In India there are excellent breeds of livestock that are well suited to changing climatic conditions, resistant to most of diseases and thrive well on crop residues. Apart from livestock food products, non-food livestock products like hides, leather & wool also offer hope for organic livestock production in India (Chander et al., 2010).

Global Scenario of Organic Livestock Production

According to FAO, livestock contributes to nearly 40% of total agricultural output in developed countries and 20% in developing ones, supporting the livelihoods of at least 1.3 billion people worldwide. Thirty four per cent of global food protein supply comes from livestock. Organic livestock farming has a greater demand due to more focus on sustainability. According to FiBL, 3.7 million organic producers were reported in 2021, an increase of 4.9% compared to 2020. India remained the country with the most organic producers (1.6 million). In 2021, 1.6% farmland around the world was organic. In 2021, the organic market reached almost 125 billion euros, an increase of 4 billion euros or approximately 3% (FiBL, 2023). The global organic meat products market will grow from $ 16.67 billion in 2022 to $ 17.99 billion in 2023 at a compound annual growth rate (CAGR) of 7.9% (The Business Research Company report, 2023). Organic dairy products make up 22.3% of overall organic farm products in the world. The global organic dairy market size reached US $ 23.9 billion in 2022, it is expected that the market to reach US $ 36.0 billion by 2028, exhibiting a growth rate (CAGR) of 6.5% during 2023-28 (IMARC Group report, 2023). According to FiBL and IFOAM, Australia has most organic agricultural land (35.7 million hectares) in the world in 2021. About 74 countries in the world had fully implemented regulations on organic farming (IFOAM- Organics International, 2023).

Conclusion

In recent years, more focus on food quality, food security, animal welfare, traceability, environment and public health have led to the rapid emergence of organic livestock farming. Tropical countries like India have great opportunity to harness the advantages of this emerging interest of people for organic products. Quality of organic products is based on standards, inspection, certification and accreditation. IFOAM has put some basic standards for the production of organic products. Different countries have their own standards for organic products. The global market of organic products is growing rapidly.

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