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Popular Article

Besides Providing Energy, Omega-3 and Omega-6 Fatty Acid Rich Oils Improve Nutrient Utilization and Growth performance of Heifers

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Introduction

For rural Indians, raising livestock is a significant means of employment, income, and survival. Milk consumption is also steadily rising over time. Between their second and fifth lactation, dairy cows reach their genetic production potential. After that, disease incidence rises and milk production gradually declines. A sound approach to the rearing of dairy animals, including nutrition management and the replacement of older and unproductive cows through culling, plays a significant role for sustained year-round milk production and maximum output from the dairy farming sector. Dairy cows' growth, production, and reproduction depend heavily on supplementing with the right nutrients in the right quantities. Energy is the most important supplement for biological function, out of all the ones available. Ruminants typically consume cereals as an energy-rich concentrate. However, excessive cereal consumption causes acidosis, which impairs ruminal digestion. As a result, heifers with high energy densities benefit from oil supplements for better average daily gain. In addition to increasing the ratio's energy density, some oils and oilseeds also perform numerous important biological functions with ultimate improvement in utilization of nutrients and growth of heifers. This is because of the particular fatty acid composition of that oils.

Dairy animals need a lot of nutrients to grow and be productive, as well as to perform reproductive functions like the early onset of puberty and the ovarian cycle. In fast-growing heifers, prolonged depletion of body reserves can have a significant negative impact on growth, production, resumption of estrus, and conception rate. The PUFA in the supplemental fat have a positive impact

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on the metabolism of carbohydrate, protein, and fat, as well as the growth and differentiation of cells by regulating gene expression in reproductive tissues, resulting in a noticeable improvement in production and fertility. Traditionally, supplemental lipid in the diet of dairy animals is included to increase dietary energy density. Due to the higher health benefits and improved reproduction efficiency of lower ratios, animal nutritionists have recently placed a greater emphasis on reducing the ratio of dietary Ω -6 to Ω -3 fatty acids in cattle diets. It is possible to incorporate a variety of polyunsaturated fatty acid-rich oil-feed ingredients as tabulated below, into the diet of dairy replacement heifers.

Table 1. Major sources of unsaturated fatty acids for dairy animals (Thatcher and Staples, 2007)

Sr. No.	Oil	C18:1 (%)	C18:2 (Ω-6, %)	C18:3 (Ω -3, %)
1.	Canola	64	19	8
2.	Palm	39	10	1
3.	Safflower	12	77	0
4.	Cottonseed	21	50	0
5.	Corn	25	60	1
6.	Sesame	42	45	0
7.	Soybean	24	53	7
8.	Sunflower	20	69	0
9.	Linseed/Flaxseed	19	14	58
10.	Fish oil	25	4	45

Results from various studies regarding the effect of the dietary polyunsaturated fatty acids (PUFA) on nutrient utilization in ruminants are inconsistent. It has been found that average postpartum dry matter intake (DMI) is not affected by dietary inclusion of roasted soybean and linseed as a source of Ω-6 and Ω-3, respectively, in the dietary regimen of heifer cows. similarly, feeding whole flaxseed also has no negative effect on DMI and milk yield because of low release of VFA in the rumen fluid. Even greater postpartum dry matter intake and energy intake has been reported in animals fed extruded flaxseed. Some studies confirm that a diet containing a high proportion of saturated fatty acids causes reduced dry matter intake than one rich in unsaturated fatty acids. However, several other studies have found that decreased intake (DMI) results from abomasal infusion of unsaturated fatty acids or from feeding the cows increasing amounts of unsaturated fatty acids at the expense of saturated fatty acids. Animals fed PUFA rich oil either maintain or improve

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their body condition score (BCS). As observed by Chilliard *et al*. (2009), BCS was not affected up to 40 days post-partum when cows were fed flaxseed as Ω-3 fatty acid source as compared to control. Dietary supplementation of rumen protected fat sources rich in PUFA has also positive effects in the improvement of digestibility of ether extract and organic matter. If the PUFA fat is given in the form of rumen bypass fat, they increases the growth rate of the heifers. The bypass fat of PUFA with varying degree of unsaturation is available as calcium salts. Childs *et al*. (2008c) fed graded level of fish oil to crossbred heifers and reported that DMI and ADG was higher at 140g of fish oil compared to diet without fish oil. Fiorentini *et al*. (2013) found that adding soybean oil to the diets of crossbred heifers did not affect nutrient intakes and utilization. Although, PUFA supplemented in the appropriate amount in heifers' ration results in better growth and nutrient utilization in heifer, but, excess amount bears negative impacts also. Diets containing high fatty acid content (>7%), especially unsaturated fatty acids can adversely affect the ruminal fibre digestion, which in addition to being toxic to rumen microflora, adhere to the food particles and cause a physical barrier between microbes and feed particles preventing their action, consequently impairing the performance of growing animals. Rations containing below 6-7% of DMI as total fat (saturated plus unsaturated), have showed that Ω-3 and Ω-6 fatty acids supplementation in crossbred heifers resulted in no negative impacts on dry matter, organic matter, neutral detergent fibre and acid detergent fibre intakes and digestion.

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