TIMOTHY

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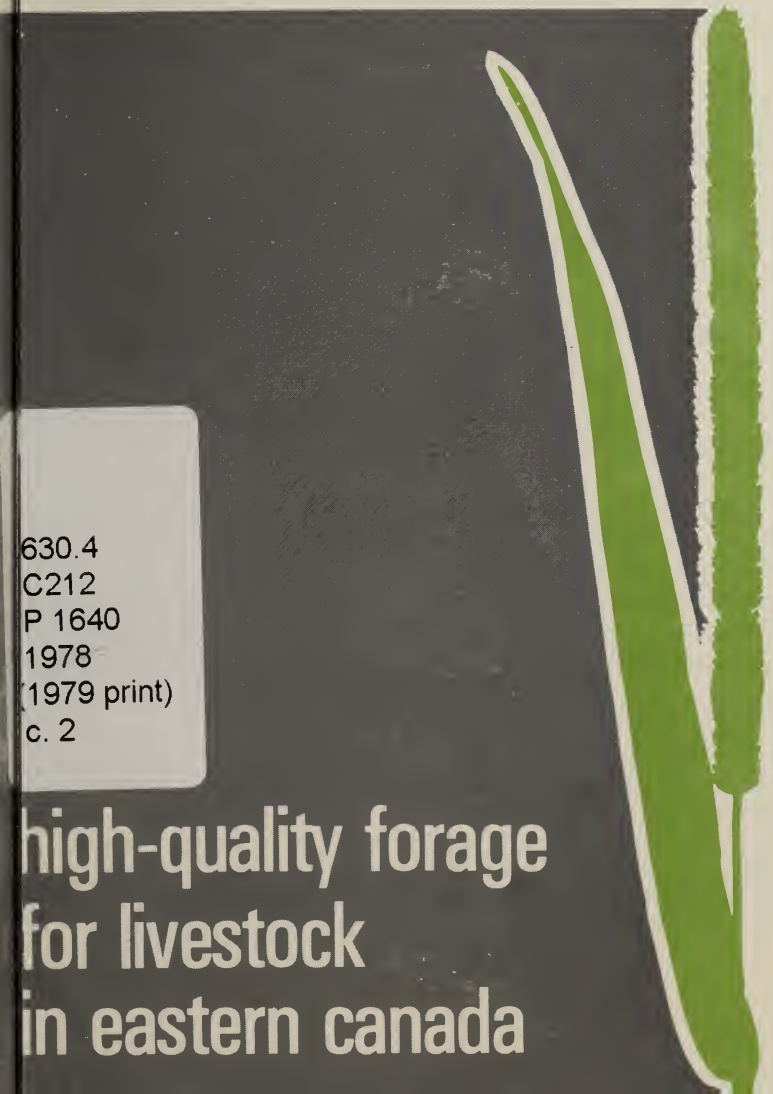

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TIMOTHY

High-quality Forage for Livestock in Eastern Canada

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A grassland system based on timothy is ideal for producing high-quality forage for ruminant livestock in Eastern Canada. This publication gives information on timothy varieties, fertilization and cutting management. It presents various methods for harvesting and storing the crop in order to obtain good yields of consistently high-quality forage. The feeding value of timothy is compared with other common crops in terms of yield, available nutrients, and animal performance.

PLACE OF TIMOTHY AS A FORAGE CROP

The climate of Eastern Canada is characterized by a short growing season in the range of 90–130 frost-free days; high rainfall, 100–162 cm, (*40–65 in.*); cool summers and harsh winters with variable snow cover. Soils in many parts of the region are highly acid, shallow, heavy textured or poorly drained. These factors severely restrict the production of important forage crops such as alfalfa and corn. Under conditions where any of these restrictions exist, timothy will often produce more livestock feed per unit of land than any other crop.

Timothy has several advantages. It is widely adapted to changes and can be grown successfully under a wide range of soil and climatic conditions. It is winter-hardy, persistent, fairly free from insects, diseases, and other pest problems. The seed is small, heavy, easy to sow, and establishes reliable stands. Also, seed is always available and normally less expensive than other types.

On the other hand, timothy has some disadvantages. Under favorable conditions, it has a top yield of about 9 t of dry matter per hectare (*4 tons/ac*), somewhat less than alfalfa or corn under the best conditions. It is not drought resistant and does not produce well on droughty soils or in areas with prolonged hot, dry spells during the growing season. Finally, there is a serious loss of quality if timothy is not harvested before the bloom stage. However, the introduction of a number of new

varieties has helped overcome the problem of quality loss when harvest is delayed. These new varieties offer a range of maturities that make it possible to spread the harvest season while maintaining forage quality.

For most medium-sized to large dairy herds, there is rarely sufficient time in Eastern Canada to harvest the large volume of forage required for winter feeding during the short period that quality and yield are at their best. Also, each year the livestock producer must have a reliable source of forage that gives a consistent yield. Timothy is able to provide these desirable features of a forage crop.

On some farms, production can be maximized by growing several crops such as timothy, alfalfa, and corn. Each forage may be grown where the soil conditions are best suited to the crop. With this combination, harvesting can continue on a systematic basis from June to late fall. However, where corn and alfalfa cannot be grown successfully, timothy, with appropriate cultural and harvesting technology, can adequately meet the needs of high-producing livestock whether it be dairy cattle, beef or sheep.

HOW THE TIMOTHY PLANT GROWS

Timothy is a perennial grass with a unique method of vegetatively renewing itself each year. In the seeding year, timothy forms only a single shoot and overwinters. In succeeding years, a seed head is formed near the base of the plant and gradually elevates to appear first as a swelling at the top of the shoot (boot stage); it then emerges, elongates, and begins to flower. As this is happening, a corm is formed at the base of the shoot. The corm is a small, onionlike bulb containing food reserves in the form of sugars. About the time that the head elongates, the corm is well formed and small buds can be seen, usually at the base of the corm. These buds are the beginning of the second crop.

The food reserves in the corm provide the nutrition for the initial growth of the second crop. As the shoots for the second crop develop, they in turn take root and form small secondary corms. A third set of shoots rises from the corms and is the overwintering stage for the plant.

The ideal harvesting method to ensure regeneration of the timothy stand and to obtain maximum yield of high-quality forage is a two cut system. Take the first cut at the full head stage, and the second cut about 45–50 days after the first cut. Delaying the first cut to the bloom stage or later not only leads to loss of

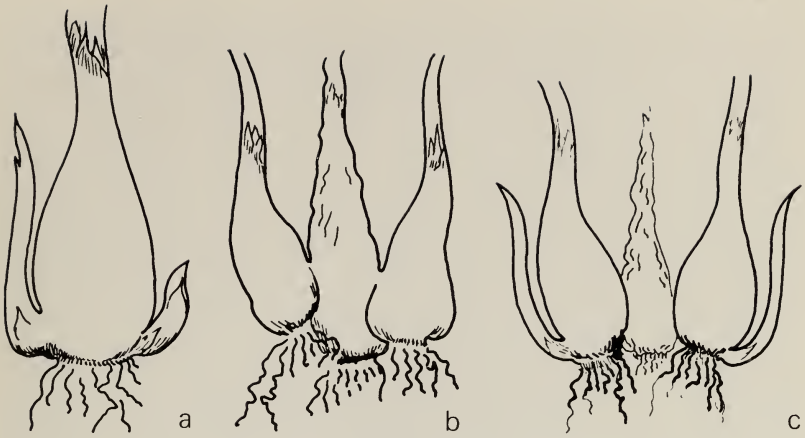

Fig. 1. Diagramatic illustration of successive stages of vegetative reproduction in timothy. (a) Primary corm with second growth buds. This stage is reached when the first growth is in the early to full head stage. (b) Primary corm has withered and secondary corms are formed at the base of second growth shoots 45 days after first crop is removed. (c) Tertiary shoots developing from secondary corms to provide overwintering stage.

protein content and digestibility, but also greatly reduces the growth of the second crop. On the other hand, cutting too early when the heads are just beginning to appear, damages plants and thins out stands.

Never cut or graze timothy during the 2-week period before the heads emerge. This is a critical stage (jointing stage) in the growth of the plant. Removing the top growth at this time greatly weakens the original plants, and the cycle of regeneration is interrupted because the corms and buds for the second shoots are not adequately formed. Timothy is, therefore, not a good grass for long-term pasture. Although it is often included in pasture seed mixtures and produces well for a year or two, it is soon replaced by other types such as bluegrass or browntop. These grasses have a different regeneration pattern and are able to withstand frequent grazing. Although timothy withstands grazing in the vegetative state, in most pasture systems it is not possible to limit grazing to this stage and the plants soon develop to the jointing stage. In most parts of Eastern Canada the jointing stage is reached in early to mid-June, but the time varies with the variety and local climate. When grazed at this stage, timothy stands are quickly destroyed.

Fig. 2. A primary corm showing second bud shoots.

PRODUCING QUALITY FORAGE BY THE TIMOTHY SYSTEM

Timothy occupies a greater proportion of the forage acreage for winter feed than any other crop grown in Eastern Canada. Unfortunately, both the yield and quality of feed stored is often well below the potential of the timothy crop. In the following section, a system is outlined that will permit the annual production of 8 t of dry matter per hectare *(3.5 tons/ac)* with a protein content of 10–15%.

In selecting a forage program, remember that timothy is a shallow-rooted plant and does not produce well in droughty soils or in regions with long periods of high summer temperatures.

Although timothy is widely adaptable, it does best under rather cool and moist climatic conditions. Under these conditions, particularly when combined with marginal soil drainage, timothy often surpasses other forage plants, not only in yield, but, perhaps more importantly, in consistency of production from year to year.

Fig. 3. Second growth on July 27 of Clair, Champ, Climax, and Bounty, which were cut when first growth reached the full head stage.

Maturity and varieties

The ideal time to take the first cut of timothy is when the plants are in their full head stage. The full head stage begins about 5 days after the heads first appear and lasts about 5 days.

In most farming operations, however, it is not possible to harvest and store the required amount of forage in a 5-day period. For this reason, it is necessary to lengthen the harvesting period and still cut the crop at its best stage of growth. With timothy, this can be done by planting a series of varieties that grow and develop at different rates.

Fig. 4. Development of timothy from boot to full head stage. Timothy should be harvested when the full head stage is reached.

A number of varieties, licensed and usually available in Eastern Canada, are listed in Table 1 according to maturity class. It is possible to lengthen the maximum harvesting period to 20 days by seeding about one-quarter of the available acreage with a variety from each maturity class. Following the same harvesting cycle 45–50 days later with the second crop, gives another 20 days for a season total of 40 harvest days.

Table 1. Maturity class of timothy varieties

Very early (June 18)*	Early (June 23)	Midseason (June 28)	Late (July 5)
Clair	Champ	Climax	Bounty
Toro	Basho	Itasca	Drummond
	Milton	Timfor	
		Pronto	

*Average date when these varieties reach the full head stage at Fredericton, N.B.

Establishing timothy

Seed sales suggest that most of the timothy now grown in Eastern Canada is a midseason or Climax type. A good starting point to establish the system proposed in this publication, would be to renew the seeding in about one-quarter of the area with a very early type, such as Clair or Toro. In subsequent years, early and late types can be seeded, depending on the amount of high-quality forage required.

A recommended procedure for seeding out is to plant 11 kg/ha *(10 lb/ac)* of certified timothy seed along with 56 kg/ha *(50 lb/ac)* of oats in a well-prepared seedbed. (Use a herbicide at the appropriate time if broad-leaved weeds are a problem). Remove the oat crop as silage at the milk stage or as green chop over the period from heading to dough. The objective of the light oat seeding and early crop removal is to permit the harvest of a crop in the seeding year, but at the same time, encourage the establishment of a strong stand of timothy seedlings.

A timothy stand can last for many years, but certain steps must be taken at seeding time to ensure strong swards. If quack grass is present, plow the area in early fall and use appropriate cultural and herbicide treatments to control this weed. The fall is also the time to incorporate limestone and manure, according to soil test recommendations. It is important also to remove large stones and ensure a smooth working surface for subsequent harvesting operations.

Although a traditional practice is to include a legume in the seeding, it is not desirable if the objective is a good strong timothy stand. In general, do not use red clover in establishing timothy because it is difficult to cure or ensile, tends to dominate the stand, and leaves a thin timothy sward when it dies out after the first crop year. On the other hand, if soil conditions and experience indicate a reasonable chance of alfalfa survival, a light seeding of up to 4.5 kg/ha (*4 lb/ac*) could be included. If a good stand of alfalfa survives, the nitrogen application can be reduced and the stand managed to favor alfalfa survival.

Fertilizing and manuring

A well-balanced fertility program is one of the keys to successful timothy production; it keeps stands strong and productive for many years without the need for plowing and reseeding.

The following treatments, based on experiments and field observations, are a general guide:

1. Spread manure at 18–22 t/ha (*8–10 tons/ac*) in the fall.

2. Apply 15-5-15 or equivalent at 225 kg/ha (*200 lb/ac*) in early spring.
3. Apply 15-5-15 at 335 kg/ha (*300 lb/ac*) after the first cut.
4. If no manure is applied, use 15-5-15 in the spring at 450–560 kg/ha (*400–500 lb/ac*).

Because soils vary greatly in natural fertility, and because manure is also highly variable in nutrient content, adjust the guide suggested above based on the results of soil tests. These tests will also indicate if limestone is needed. Although soil acidity is less critical for grasses than for legumes, try to maintain the pH at 6.0 or above for efficient fertilizer utilization. A light topdressing of limestone may be necessary every 4 or 5 years to counteract natural and fertilizer acidifying effects.

In addition to having the soil tested, observe the growing timothy crop for nutrient deficiencies. A general yellowing of the foliage along with slow growth is the result of inadequate nitrogen. If fertilizer is applied as suggested above, nitrogen deficiency should not occur in the first or second crops. It could, however, become evident in the fall growth after two successive heavy crops have been removed. Manuring or a light dressing of nitrogen at this time will strengthen the plants for overwintering and improve the next year's growth. Typically, potassium deficiency is indicated by a browning and drying of the leaf tips, particularly during the period of second growth. An application of potash will quickly correct this condition. Potash is essential

Fig. 5. Insufficient nitrogen results in a yellowish, short stand.

Fig. 6. When nitrogen and potassium are lacking timothy is soon replaced by weeds.

Fig. 7. A typical symptom of potassium deficiency — browning of leaf tips.

for the growth and development of corms and is therefore important for good vegetative reproduction and persistence.

It has been observed on many soils that the application of nitrogen without potassiurn leads to a weakening of timothy and its replacement by bluegrass and bentgrasses.

Weeds, insects, diseases and pests

The timothy crop is remarkably free from weeds, insects, diseases, and damage by birds and animals and, in this respect, the management of the crop is fairly simple.

The first step in weed control is the well-balanced fertility program outlined above. This, along with a two cut system, will keep timothy stands strong and competitive, and the early cutting prevents weeds from getting to the seed stage. One exception is the dandelion. Fortunately, this weed in most cases can be easily controlled with an inexpensive herbicide. Quack grass can also become a problem if it is present when fields are seeded. It is particularly competitive with the midseason and later-maturing varieties of timothy. However, unless it is allowed to dominate the sward, it does not seriously reduce yield or quality.

Numerous insects may infest a timothy stand, but normally they cause no significant economic damage to the crop. The European skipper, recently observed in eastern Ontario and Prince Edward Island, could become a problem if present populations increase and spread. Eggs are laid in timothy stems in late June or early July so early cutting of timothy stands helps control the skipper.

A number of fungal diseases attack the leaves of timothy, and these are a factor in lowering quality when cutting is delayed. Harvesting at the recommended times helps to prevent any significant losses from either insects or diseases.

Harvesting and storing

The wilted-silage method is the ideal way to store high-quality timothy. This method is less dependent on extended periods of fine weather than that needed for curing of hay, making it possible to store the larger volumes of quality forage needed for today's bigger herds of high-producing animals.

The objective in wilting silage is to reduce the moisture content from about 80% in fresh cut grass to about 65%. This can take 2 h on a fine day and longer periods on overcast days, depending on wind and humidity. Wilting prevents seepage

losses and reduces the risk of poor fermentation, which can result in foul-smelling silage of poor quality. It also produces a product more acceptable to livestock, resulting in greater dry matter intake and a high level of milk production.

Take care not to overwilt, particularly if the product is to be stored in a bunker type silo. Silage wilted to 50% moisture or less is commonly referred to as "haylage." This can be a high-quality product, but in storing it is difficult to pack to the point of good air exclusion. Haylage should only be attempted with upright silos that are, or can be completely sealed.

Fine chopping, moderate packing, and good sealing to prevent air moving through the silage mass, are key points in making good silage from grasses.

Complete instructions for silage making are beyond the scope of this publication. Anyone making silage or haylage for the first time is advised to study the literature on the subject, as well as the equipment and techniques used in successful operations.

The second-best method for storing timothy is field curing combined with barn finishing. This method is satisfactory for small operations and may be a better choice when the crop is grown several kilometres from the feeding or storage area. The main weakness of a system based on field curing is that harvesting must often be delayed too long because of inclement weather.

A third method, which makes use of silage and haymaking, may prove satisfactory on larger farms that have the necessary storage facilities, equipment, and labor.

When the system described is followed, the producer will observe that a considerable third growth occurs particularly from the very early and early maturing varieties. Because this growth is the overwintering stage it should not be severely defoliated. Cutting the third growth tends to weaken the stand, delay the onset of growth the next spring and reduce yield. If early varieties are harvested and later varieties left it tends to defeat the system because all varieties would reach the heading stage at the same time the following year. A light grazing is tolerable if necessary, but avoid severe grazing or removal as green chop.

ADVANTAGES OF A TIMOTHY SYSTEM

- No crop failures — using the system described, a yield of up to 9 t/ha (*4 tons/ac*) can be obtained in most seasons and 60% of this yield in acute dry seasons.
- Timothy is widely adaptable and extremely winter-hardy.
- Once established, plowing and reseeding costs are negligible.

- Protection costs to limit losses from weeds and pests are negligible.
- When the harvesting is completed at the end of August, there is time for spreading manure under favorable field conditions.
- Timothy has a good level and balance of protein and energy when harvested and stored at the full head stage.

FEEDING VALUE OF TIMOTHY

Timothy for use as a forage crop contains similar amounts of energy but less protein than alfalfa (Table 2) and less energy

Table 2. Feeding value of timothy compared with alfalfa and corn

	Dry matter	Dry matter basis			
		Net* energy		TDN†	Crude protein
	%	Mcal/kg	*Mcal/lb*	%	%
Timothy					
Prebloom	88.6	1.46	*0.66*	63	12.3
Late bloom	88.0	1.25	*0.57*	57	8.3
Alfalfa					
Prebloom	84.5	1.46	*0.66*	63	19.4
Full bloom	87.7	1.25	*0.57*	57	15.9
Corn silage	27.9	1.70	*0.77*	70	8.4

*Net energy for lactating cows
†Total digestible nutrients
Source: *Nutrient requirements of dairy cattle,* fourth revised edition, 1971. National Academy of Sciences.

but more protein than corn. Thus, timothy is an intermediate crop for ruminant livestock, well balanced in energy and protein. However, the feeding value of timothy declines rapidly if it is not harvested at the proper stage of maturity. Digestibility declines 0.5 percentage units or more per day from the boot stage to flowering (Table 3). Also as the digestibility decreases, the amount of forage dry matter consumed by the animals declines. Thus, to obtain high levels of milk production, harvest timothy at the heading stage when the crop combines high dry matter digestibility and acceptable dry matter intakes.

Studies at the Research Station, Fredericton, N.B., (Table 4), indicate that first and second cut, wilted timothy silages

Table 3. Digestibility and intake of timothy at various stages of growth

Cutting stage	Dry matter digestibility %	Dry matter intake % body weight
Vegetative	67.8	2.4
Boot	63.1	2.2
Heading	60.8	2.1
Flowering	52.2	1.8
Seed	46.9	1.3

Table 4. Comparison of corn and timothy silages for milk production

	Experiment I		Experiment II	
Item	Timothy 1st cut	Corn	Timothy 2nd cut	Corn
Silage DM (%)	33.7	27.0	32.7	28.5
Silage DM intake				
kg/cow per day	10.9	11.5*	11.2	10.9*
lb/cow per day	*24.0*	*25.3*	*24.6*	*24.0*
Total DM intake				
kg/cow per day	17.3	18.6	18.1	18.1
lb/cow per day	*38.1*	*40.9*	*39.8*	*39.8*
Milk yield				
kg/cow per day	22.3	22.9	21.7	22.0
lb/cow per day	*49.1*	*50.4*	*47.7*	*48.4*

*Corn silage with 0.5% urea added at the time of ensiling.

harvested at the heading stage from Clair, Champ, Climax, and Bounty were equal to corn silage for milk production when fed as the only forage to dairy cows. The timothy silages used in these studies averaged 13.6 and 12.3% protein for the first and second cuts, respectively. Urea was added to the corn silage to increase the equivalent protein level to 11.2%. Cows in both studies received a 16% protein grain mixture fed at 1 kg of grain for each 3 kg of 4% fat-corrected milk. Therefore, provided it is harvested at the proper stage, timothy can be relied upon as a dependable source of high-quality forage for high-producing livestock.