Extending the Period of High Feed Value in Italian Ryegrass (*Lolium multiflorum* Lam.) for Grazing in the Warm Temperate Zone of Japan

Makoto Kaneko
NARO, Japan

Yoshi-nori Nakamura
NARO, Japan

Akihisa Yamada
NARO, Japan

The 22nd International Grassland Congress (Revitalising Grasslands to Sustain Our Communities) took place in Sydney, Australia from September 15 through September 19, 2013.

Proceedings Editors: David L. Michalk, Geoffrey D. Millar, Warwick B. Badgery, and Kim M. Broadfoot

Publisher: New South Wales Department of Primary Industry, Kite St., Orange New South Wales, Australia

Extending the period of high feed value in Italian ryegrass (*Lolium multiflorum* Lam.) for grazing in the warm temperate zone of Japan

Makoto Kaneko, Yoshi-nori Nakamura and Akihisa Yamada

NARO Kyushu Okinawa Research Centre, Koshi, Kumamoto, Japan, www.naro.affrc.go.jp/karc/index.html
Contact email: m2k2@affrc.go.jp

Keywords: Fattening cattle, feed value, Italian ryegrass, pasture, winter habitat

Introduction

Japan has widely diverse climate conditions, from subtropical in the south to boreal in the north. In warm regions of the temperate zone in the south-west, such as low-lying areas of Kyushu Island, temperate grasses only barely survive during the summer (Area V in Fig. 1). Therefore, for year-round grazing, tropical grasses and temperate grasses have been used, respectively, for summer and winter (Fig. 2). Throughout Japan, grazing is limited for cows and their calves and fattening takes place in barns. Recently, as consumer preference for meat has diversified, the demand for lean meat with less fat from grazing cattle has been increasing. As the improved marbling and growth of Wagyu breeding demands high-value feed for fattening, grazing fattening of Wagyu also requires high-value feed. Currently, Italian ryegrass (IR; *Lolium multiflorum* Lam.) is used as high-value feed grass in the Southwest warm region in winter. IR presents the critical problem that feed value declines along with its ear emergence. Furthermore, the feed value of tropical grasses grown in summer is less than that of IR. Grazing cattle need more energy to cope with high temperatures of summer than they do for winter. Because of these factors, intake of energy and weight gain rate decline in summer. To resolve these problems, a new pasture system is proposed to maintain high feed value throughout the year (Fig. 2): a group of cultivars of IR that grows well in winter should be sown in autumn. Then a type of winter habitat IR should be sown in early spring. In such cases, winter habitat IR sown after winter will not flower because it has not been vernalised by low temperatures. This IR exhibits superior re-growth and heat resistance. Therefore, this new system can help prevent a decline of feed value associated with ear emergence and also prolong the available period of IR.

This study investigated the effectiveness of the new system for extending the period of high feed value in IR.

Methods

The study was conducted at the NARO Kyushu Okinawa Research Centre, Kumamoto, Japan (32°53'N; 130°44'E, 85 m a.s.l.) in 2012. The average annual temperature at the study site was 15.6°C. The respective average monthly temperatures in January and August were -1.2°C and 22.8°C. The annual mean precipitation was 1882 mm. The soil was heavy clay (Hydric Pachic Melanudands). The study site, established in the autumn of 2011, had been used

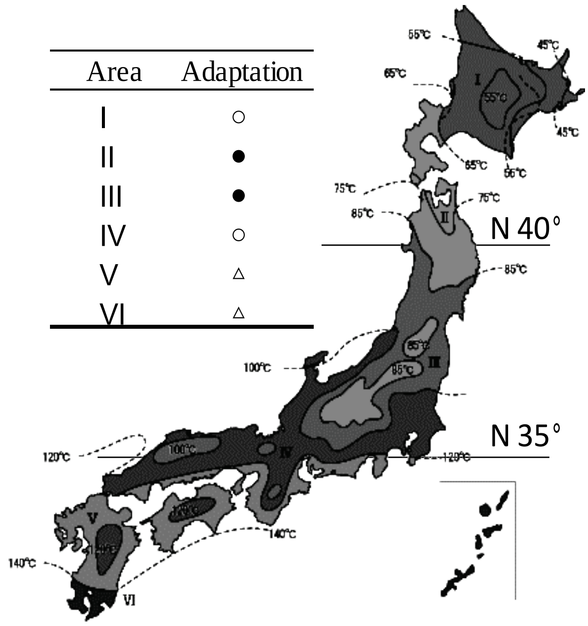

Figure 1. Map of Warmth Index in Japan and adaptation of ryegrass. Numbers of degrees are cumulative average monthly temperatures above 5°C. ●, well adapted; ○, adapted; △, limited adaptation. Map and adaption reproduced from Sato (1995).

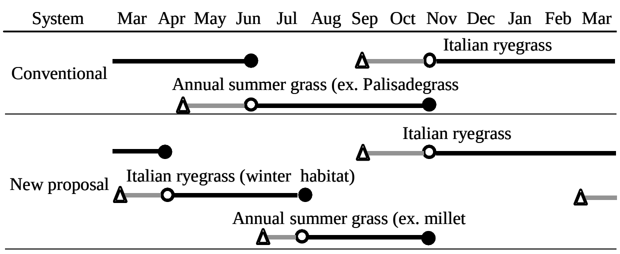

Figure 2. Year-round grazing system in warm areas of Japan. Conventional systems use Italian ryegrass in winter and annual summer grass in summer. The proposed system adds spring Italian ryegrass to conventional systems for extension of the period of high feed value Italian ryegrass. Δ, seeding; ○, grazing start; ●, grazing end.

habitat, diploid).
for grazing with Italian ryegrass (var. Nagahahikari, spring habitat, diploid). Two tetraploid, winter habitat cultivars of IR were sown on 27 February 2012: 'Ace' and 'Akiaoba 3'. We sowed 30 kg seed/ha of "Ace" on 0.3 ha of pasture

Table 1. Biomass and feed values of two winter habitat Italian ryegrass cultivars sown in spring (mean ± SD)

sampling date	cultivar	IR biomass g/m^2	dead matter g/m^2	dry matter ratio of IR (%/FM)	CP of IR (%/DM)
6-Jun	Ace	108.2 ± 48.3	59.4 ± 14.8	15.6 ± 2.4	16.2
	Akiaoba 3	139.8 ± 17.4	65.3 ± 18.6	16.9 ± 2.3	14.3
19-Jul	Ace	57.7 ± 16.5	112.2 ± 44.1	29.1 ± 3.5	18.5
	Akiaoba 3	120.1 ± 10.8	70.8 ± 19.2	19.8 ± 1.1	19.8

area; 30 kg/ha of “Akiaoba 3” was sown on 0.2 ha of pasture area. Both pasture areas were grazed together in two periods: the first grazing period started on April 24 and ended on May 23, whereas the second period was from June 6 to July 19. Three cages (1.2 m ×1.2 m, 1.6 m height) were used to protect grass from grazing in each pasture area at the start of the second period. At the start of the second grazing (June 6), three 1 m^2 quadrats were harvested at 5 cm height from ground level from both IR to measure available biomass. This procedure was repeated at the end of the second grazing (July 19), when pasture was also harvested from underneath all cages. All harvest from pasture was thus weighted as Italian ryegrass, weed and dead matter. After drying at 70°C for more than 3 days, herbage harvested from pasture was weighed and then ground to 1 mm, and then analyzed for crude protein (CP) concentration according to AOAC (1990).

Results and discussion

Very little ear emergence was visible in either cultivar on June 6. The characteristics of the winter habitat breed, sown after winter will not flower because it has not been vernalised by low temperatures, were not impeccable either in “Ace” or “Akiaoba 3”. Pasture biomass was greater in Akiaoba 3 than in Ace on June 6 and July 19 (Table 1). From June 6 to July 19, the biomass of Ace dropped by50% and the amount of dead matter increased 100%. In contrast, the biomass of Akiaoba3 decreased only 15% and dead matter content did not increase. In addition, the regrowth rate of Akiaoba 3 from July 2 to July 19 was 0.4 g/m^2/day compared to -0.2 g/m^2/day for Ace. The dry matter ratio is high only in cultivar “Ace” on July 19. These results imply that Akiaoba 3 is more suitable for summer use.

There were no differences between cultivars in the CP concentration of herbage on June 6 and July 19. The CP content of both cultivars on June 6 was less than on July 19, indicating that even slight ear emergence decreases the feed value. Fertilizer nitrogen was not applied after first grazing which may have reduced CP concentrations in herbage at the start of the second grazing.

Conclusion

The period for which high value IR feed is available for grazing can be extended beyond the ear emergence season. To achieve this reliably, further research is required to identify suitable alternative cultivars and nitrogen fertilization methods.

References

Association of Official Analytical Chemists (1990) Official methods of analysis, 15th edn. AOAC. (Arlington, VA: USA)

Sato S (1995) Physio-ecological characters of cool and warm season turfgrass. *Journal of Japanese Society of Turfgrass Science* **23**, 145-157 (in Japanese).