Genetic Resources of Temperate Legumes for Improving Forage Quality in Russia

V. F. Chapurin
Russian Academy of Agricultural Sciences, Russia

A. V. Bukhteeva
Russian Academy of Agricultural Sciences, Russia

The XXI International Grassland Congress / VIII International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

Genetic resources of temperate legumes for improving forage quality in Russia

V .F . Chapurin , A .V . Bukhteeva
State Scientific Centre N .I . Vavilov All-Russian Research Institute of Plant Industry of RAAS
Bolshaya Morskaya str . , 42 ,St . Petersburg , 190000 , Russia , E-mail : v .chapurin@vir .nw .ru

Key words : genetic resources ,perennial forage crops ,seed collection ,seed storage

Protein content of perennial forages can be improved most economically by the addition of leguminous species into the forage mixture . Currently only a very limited number of forage legumes are used in forage production compared to the total number of legume species . The N .I . Vavilov All-Russian Research Institute of Plant Industry (VIR) has a total of 220 different legume species in its collection from expeditions around the world with the most collections represented for red clover (*Trifolium pratense* L .) and alfalfa (*Medicago sativa* L . and *M . varia* L .) . Besides red clover and alfalfa , only six other legume species are well known in Russia , but their use is very limited , including sainfoin (*Onobrychis arenaria* L . , *O . transcaucasica* L .) , white clover (*Trifolium repens* L .) , hybrid clover (*Trifolium hybridum* L .) , yellow-flowered alfalfa (*Medicago falcata* L .) , and sweet clover (*Melilotus officinalis* L .) . Besides these above-mentioned species , cultivars have been released for 11 other forage legumes . As a result , the largest portion of forage legume germplasm has not been fully developed and utilized for forage production .

Based on comprehensive field studies conducted across multiple years in Russia and Central Asia , protein content from fresh mass was evaluated . Forage legume collections with the highest protein content were identified from these results . For red clover evaluated in northwestern Russia , the best collections had protein contents that were 2 .5 to 3 .7 % higher than the standard check cultivar (Sivoritsky 416) . The best red clover collections were wild collections from Sverdlovsk , Nizhniy Novgorod , Moscow area , and Yakutia . For alfalfa evaluated in Central Asia , the standard check variety was Tibetskaya , which had a protein content of 17 .5 g/kg based on dry matter . The alfalfa collections that had 2 to 2 .5 % higher protein content than the standard check variety were 95 v Plus , WL-316 , and WL-315 , whereas HB from the USA had a 3 . 0 % greater protein content and Marchigiona from Italy had a 5 .3 % greater protein content than Tibetskaya . The fiber content of these same alfalfa collections were 3 to 7 .8 % lower than Tibetskaya . At the VIR Moscow Station , the standard check alfalfa variety (Severnaya Hybridnaya) had a protein content of 15 .5 g/kg compared to 18 to 19 g/kg for self-pollinated populations from the Priaralskoy Experiment Station (SFA 21 , SFA 140 , SFA 162) , Au-Px from Hungary , a commercial variety from USA , a local variety from Yemen , and Vega from the Russian All-Union Institute of Forage Crops . The same alfalfa evaluation trials conducted in the Tyumen area of Russia showed that the best alfalfa varieties (Karabalykckya , Siberian 230 , Omsk 192 , Kokshe , and Klezczewska) had protein contents of 16 .5 to 17 .9 g/kg . The lowest fiber content was found for alfalfa varieties from Central Asia , Italy , and Argentina .

Persistence of legume crops in various regions of Russia was defined by their stability to ambient environmental conditions with the main causes of plant mortality for red clover occurring from frost damage and snow mold . Stability estimates were obtained in the field and growth chambers . Red clover varieties from eastern Siberia had the highest frost resistance scores (mean of 4 to 5) with those from northwest Russia , the Volga-Vjatsky Region , and northern Europe (Norway , Sweden , and Finland) having scores of 3 to 4 . Snow mold occurs most frequently in northern areas of the European portion of Russia and is especially widespread in northwest Russia . Snow mold also occurs in Ukraine . Red clover collections from these areas had very high resistance to snow mold and typically had scores of about 4 .7 .

With the goal to increase the use of non-traditional leguminous crops for enhancing forage protein content , *Galega orientalis* Lam . from the northern Caucuses Region was identified as a particularly promising forage legume from numerous studies across many regions of Russia . For example , at the Kuban Experimental Station in the northern Caucuses , fresh weight productivity of this species was 80 T/ha . Protein content of *G . orientalis* was similar to alfalfa , and the sum of irreplaceable amino acids was 76 .2 g/kg fresh weight . *G . orientalis* added about 170 to 396 kg/ha of nitrogen , 45 to 80 kg/ha of phosphorus , and 94 to 113 kg/ha of potassium (Prosvirin , 1987 , 1991) .

Astragalus uliginosus , a species from eastern Siberia had low levels of alkaloids . During flowering , protein content of *A . uliginosus* was 27 to 29 % on a fresh weight basis .

Annual species of *Medicago* (*M . lupulina* , *M . scutellata* , *M . orbicularis*) and *Trifolium* (*T . alexandrinum* , *T . apertum* , etc .) were studied at the Maykop Experimental Station in the northern Caucuses for forage production as a pasture component to increase forage yield during the year of establishment . *T . apertum* was of special interest because it can be established in the autumn , resumes growth early the following spring , and is endemic to the northern Caucuses Region . It also produces 5 to 6 T/ha fresh weight compared to 3 .3 T/ha for Abadzehskiy red clover . *T . apertum* also had higher carotin content than the standard (3 .7 to 6 .1 g/100 kg) and a dry matter protein content from 14 .5 to 18 .4 g/kg (Pershin , 1991) .