Potential use of cultivated range plants as animal feed in the Mediterranean coastal zone of Egypt

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Summary: The green biomass produced from the native rangelands in the Mediterranean coastal zone of Egypt, particularly in dry seasons, may not sustain the requirements for the large population of animals. It is thought to improve the native plant species as well as to introduce some grasses, legumes and saltbushes of high potential to fill the gap of feed shortage. Some of these species are well adapted to saline soils and drought stress. Several salt tolerant grasses and legumes as well as saltbushes are promising due to their high productivity, rapid tender growth, palatability and suitable nutritive value. A brief overview concerning the production potential of some exotic and native plant species is presented and their potential for utilization as fodder under salinity and aridity conditions is discussed.

Key-words: Legumes, grasses, saltbushes, forage mixtures, sheep and goats.

INTRODUCTION

Intensive efforts have been made to improve the present situation of the natural ranges which are poor, deficient in energy content, particularly during the dry seasons and cannot, even provide the maintenance requirements of grazing animals (Abd El Aziz, 1982). Rehabilitation of such rangelands with suitable shrubs, grasses and legumes can considerably provide low-cost fodder to animals. Saline soils in arid and semi-arid lands located mainly in the western and eastern Mediterranean zone of Egypt pose difficulties in land use since the application of ameliorative measures is very much constrained by economic and climatic factors. The alternative approach of economic utilization of saline rangelands and newly reclaimed soils is by planting salt tolerant or/and drought resistant plant species. Among such forages are saltbushes, salt tolerant grasses and legumes.

SPECIAL CHARACTERISTICS OF THE MEDITERRANEAN COAST OF EGYPT

The Mediterranean coast of Egypt extends for about 900 km. The soil is characterized by deep profiles which vary in texture: sandy, calcareous, and sandy clay loam. The salt composition of soil is, generally, in the form of sodium chloride, calcium chloride and calcium carbonate. The characteristics of soil as well as underground water vary greatly from area to area along the coast, which considerably affect the distribution, biomass and quality of pastures. Such forages are resistant to salinity and drought; exhibit a great potential for the rehabilitation of degraded and are the main source of animal feeds.

SALTBUSHES

Certain species of grazable saltbushes have been introduced to Egypt for testing their growth on salt-affected lands and saline water irrigation barren sandy areas. Some of these species are exotic saltbushes such as *Atriplex nummularia, A. canescens, A. semibaccata, A. glauca.* The native saltbushes, which most widely utilized as fodders, are *A. halimus A. vesicaria* and *A. leucoclada.* Several studies have been conducted regarding utilization of saltbushes in animal feeding (Hassan and Abd El Aziz, 1979 and Kandil and El Shaer, 1990). Saltbushes, in general, are characterized by moderate crude protein (CP) and high mineral contents, particularly Na, K, Cl and Ca concentrations. Defficiency of available carbohydrates together with the rapid fermentation of its CP in the rumen may be responsible for the poor utilization of saltbush protein as judged from the large losses of nitrogen in urine (Hassan and Abd El Aziz, 1979). They reported that feeding on *Atriplex* only adversely affects the general condition of sheep and goats with more pronounced effect on sheep. Coordination between the concentration of dietary readily available carbohydrates and ruminal ammonia-nitrogen is recognized to maximize the utilization of dietry nitrogen by micro-organisms. Barely grains are suggested to stimulate saltbush intake and to correct the misuse of ruminal ammonia-nitroges. The nutritive value of saltbush, fed to sheep, could be improved by a level of 150 g barley/head/day (Hassan and Abd El Aziz, 1979). This amount of barley seems to be adequate for sheep and goats only during the wet season because of high levels of CP and ether extract (13.8 and 5.0%, respectively, in the spring). However, animals should recieve more than 150 g barley/head/day when they graze *A. nummlaria* during the dry season as the plant contains less CP and high levels of lignin and neutral detergent fiber (El Shaer and Kandil, 1990). The stage of growth and maturity considerably affect the nutritive value, palatability and utilization of *Atriplex* species. Such plants are nutritious in wet seasons while they are poor during dry periods. Consequently, utilization of *A. nummularia* by sheep and goats given barley grains as a supplement, was much better during wet seasons rather than during summer and autumn. A daily amount of 250 g of barley grain/head/ was recommended for sheep and goats during dry seasons (Kandil and El Shaer, 1990) to avoid the adverse effect of sole *Atriplex* feeding.

SALT TOLERANT GRASSES

Great attention have been directed to propagate and evaluate several exotic and native Gramineae species in Mediterranean coastal zone of Egypt. The most common grasses and their vareities which can be easily grown as animal fodder are: napir grass (*Pennisteum purpereum*), blue panic grass (*Panicum antidotal*). rhodes grass (*Chloris gayana*), buffel grass (*Cenchrus ciliaris*), green panic grass (*Panicum maximum*), *Pennesium ciliare*, *Phalaris tuberosa*, love grass (*Erogrostis superba*) and sudangrass. Among these grasses, green panic, blue panic and napir grasses could be the best grasses for propagation as they attained higher values of CP, DMD, TDN and DCP with lower values of CF, lignin, and NDF, regardless the date of harvesting (El Shaer *et al*, 1984, and El Shaer *et al.* 1987). Such grasses contained sufficient concentrations of major and minor elements, except for sulphur, to maintain the mineral requirements. These authors reported that the six grasses, were nutritious as they attained enough nutrients that could provide the nutritional requirements of animals. Rhodes grass and their varieties, particularly gallide variety attained the highest production of DMD, TDN and DCP (kg^{-1}/ha^{-1}) as the DM yield was the greatest among the other grasses (El Shaer et al, 1987). However, such grasses are poorly utilized by ruminants after the 3rd cut due to the high content of poor digestible fibrous fractions which related mainly to lignification of cell walls. So, a proper treatment such as chemical or biological process should be practiced to improve their utilization.

SALT TOLERANT LEGUMES

Intensive studies have been conducted to select suitable exotic species that tolerate salinity and drought, as well as to improve the biomass and nutritive value of native legume species. Five exotic legume species, out of ten, were selected in a study carried out in North Sinai (El Shaer et al, 1984). They were : Sulla (*Hedysarum carnosum*), acacia (*Acacia saligina*), *Colutea haleppica*, sanfoin (*Onobrychis spp.*) and sanfoin-common (*Onobrychis vicifolia*). *Colutea haleppica*, sulla and sanfoin-common exhibited the highest nutritive value in terms of CP, DMD, TDN and DCP. These species contained sufficient levels of major elements (Ca, P, Na, K, Mg and S) and trace elements (Zn, Cu, Fe and Mn) which appeared to be more than enough to maintain the mineral requirements of animals. This study also suggested that these legumes can successfully propagate to solve the feed shortage, particularly during the dry seasons. In the north western coastal zone, bard vetch (*Vicia monontha)* and *Sscorpiurus muricatus L.* are highly drought tolerant as well as to water stress; too rich in protein content and are used as important forages in this region (Maamoun, 1994). The nature distirbution and nutritive value of these plants depend on the rainfall and soil characters. Such plants are characterized with high nutritive value and palatability for small ruminants as CP, carbohydrates and fats reached about 20, 45 and 2% of the DM, respectively (Trevino *et al*, 1981). Remarkable differences were observed among some native vetch species *(Vicia sativa, V. villosa, V. narbonensis, V. monantha* and *Lathyrus sativus*) in terms of seedling vigour, flowering time and forage yield (Radwan and El Fakhry, 1975). The nutritive value and biomass yield of such legumes were greatly affected by stage of growth, harvesting time and many other factors. Trevino *et al.* (1981) cut *Vicia monantha* at 7 growth stages from vegetative to rip seed stage in 3 successive years. Mean values of CP, NDF, lignin and ash were changed with increasing maturity. Irrigation (underground saline water) factor, has also an influence on the biological yield and nutritive value of some legumes. Mammoun (1994) indicated that the biological, straw and seed yields of *Vicia monatha* and *Scorpiurus muricatus* were affected by decreasing the amount of irrigation water and the average of increasing rate was more than 50%. Such trends may be attributed to the ability of the two plant species to produce good propagation organs under water stress. It is a distinguished feature of such desert plants as they increase the water use efficiency.

FORAGE CROP MIXTURES

Mixing of legumes with grasses or legumes with saltbushes is an acceptable practice to have more advantages of the stand. Egyptian clover (*Trifolium alexandrinum L.*) is commonly sown with barley (*Hordeum vulgare*) or Italian ryegrass (*Lolium multiflorum L.*), particularly , where low-saline irrigation water (less than 2000 ppm total salt) is available. An appropriate mixture of a ratio 3:1 was highly recommended by El Hakeem (1985) to improve the nutritive value, physical and phsiological feeding properties of the forages. On the other hand, cowpea (*Vigna unguiculata L. Walp*) is considered one of the most promising crops that may intercrop successfully with many grasses (i.e. sudangrass, millet, cassava and sorghum) for better quality and quantity of forage yield. The cowpea is a predominantely hot-weather crop, well adapted to arid conditions and frequently mixed with grasses under the conditions of the northern coast of Egypt. Intercropping cowpea and sudangrass using different patterns, generally offered a significant increase in dry forage yield of cowpea and subangrass as well (Mohamed 1992). Plant hight, leaf/steam ratio, CP content, carbohydrates content of cowpea and sudangrass were significantly increased.

The agricultural extension service has started to persuade and teach farmers to grow the most common and adaptable grasses, legumes and saltbushes on their lands using underground saline water for irrigation along the northern coastal belt areas. About one million seedlings of *Acacia saligna* and *Atriplex nummularia* have been distributed and already transplanted. In addition,

about 30 tons of palatable legumes seeds (native and exotic species) have been sown for the undergrowth of such trees and shrubs. A propagation farm (about 100 ha) has been established to be used for the production of seeds of annual legumes and shrubs with high nutritive value and palatability in order to be resown in range improvement areas.

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