

THE EFFECT OF WEEDS ON RHODES GRASS PRODUCTION IN OMAN

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A – Introduction

Agriculture in Oman

Oman is one of the oldest independent states among the Arabian countries and is located at a strategic position at the south-eastern corner of the Arabian Peninsula according to BBC News (2016). Majority of Oman is a sub-tropical desert with average temperatures ranging from 17.8 degrees to 28.9 degree Celsius. Agriculture and fisheries are one of the key employment areas in the Sultanate of Oman. The UN Food and Agriculture Organization and Oman's Ministry of Agriculture and Fisheries (MAF) have estimated that about 1.77m ha of land in Oman currently falls under agricultural land and 73,500 ha of land can be further cultivated. The majority of cultivation happens in the Al Batinah plains in Oman's north-western region falling between Muscat and the UAE according to the report provided by Oxford Business Group (2014). There are productive valleys in these plains and ample levels of water table which get replenished naturally by storm run-off providing seasonal water flows for irrigation purposes. The Dhofar region in the south-west ranks as the second agriculturally productive region in Oman. The monsoon crop (khareef) is the main product of this region in the months of July to September as this area receives the highest rainfall in Oman of about 200 to 260mm. The growth rate of agriculture has not been on par with the dramatic growth rate of other sectors like oil and industries. Agricultural contribution to the GDP of Oman was 2.8% in 1995 which has fallen down to 1.1% in 2012 and 0.7% in 2014 says Oxford Business Group (2016). The agricultural sector was up by 4.8% in 2013 after a drop of 2.5% in 2012. The government of Oman wants to increase the contribution of farming and fishing towards the GDP to 5.1% by 2020. Dates is the primary crop in Oman accounting for 80% after which come tomatoes, cucumbers, corn, watermelons. Besides these fruits and vegetables, fodder crops like Rhode grass and alfalfa also

are being cultivated in Oman. As of 2013, Oman was estimated to be 72% self-sufficient for its fruit demands, 62% for vegetables. The livestock levels also have increased steadily and people in Oman are preferring Oman's dairy products as against the previous trends of importing them. This has led to demand for fodder crops too along with fruits and vegetables as per Oxford Business Group (2014).

Role of Rhodes grass in Oman

Rhodes grass is one of the most popular fodder crops grown in Oman to meet the needs of its increasing livestock. Along with alfalfa, Rhodes grass is grown predominantly in the Batinah region and it occupied 62% of the total area in Oman occupied by Rhodes in 2004 reported by MAF, Oman (2007). It is used as fresh fodder in pastures as well as in the form of hay by drying the grass and used during winter.

Problems in Rhodes grass production

Increasing human and livestock population in Oman has led to an increase in demand for food and dairy products. This in turn has led to expansion in cultivation area for food for human consumption as well as fodder for livestock, subsequently leading to increasing demand of water for irrigation. Oman being arid and near the sea, potable water is a scarce resource. Rhodes grass requires more water than what is available in Oman and hence cultivation of Rhodes is putting a strain on the water resources in Oman observed by Mishakhi & Koll (2007). Also, Rhodes grass requires nitrogen fertilizers in order to grow to their full potential in Oman due to the low levels of natural nitrogen presence in the soil states Dutton (2013).

Problem of weeds

Alfalfa which was among the first fodder crops to be grown in Oman was found to be highly affected by weeds. In order to solve this problem, it was rotated with Rhodes grass. Research studies show that Rhodes grass does not seem to be impacted much by weeds once it matures as it itself overgrows the weeds and is fit to survive in different climatic conditions.

Aim of report

Through this report, the impact of weeds on production of Rhodes grass in Oman is explored. Through conducting a literature review the background of Rhodes grass, its significance in Oman, the problems faced with its production, the impact of weeds on it and how different farming methods are adopted to solve the menace of weeds have been explored.

B – Rhodes Grass Background

Chloris gayana or commonly called as Rhodes grass is a native of Africa and then introduced in India, Pakistan, Australia and the USA writes Whitmore (2013). It is an excellent forage grass spread across tropical and subtropical countries used both for pasture and hay.

Description

Rhodes grass is a perennial grass which can spread easily through its seed and stolon and its stalk can grow as tall as 1.5m. In the tropical countries, Rhodes grass, can produce up to six cuts in a year while in high latitude areas it can yield only one crop a year writes Whitmore (2013). The grass cannot survive in temperatures less than -8 degree Celsius. It needs 600-750 mm of rains annually enabling it to grow even in dry areas. It can survive droughts due to its ramified roots which can extract nutrients and moisture from the soil. The grass grows best in moist soil even if

its alkaline in nature. The first yield is the most productive of all and Rhodes grass growing in moist soil is leafy, highly nutritious and enjoyed as a fodder by livestock according to writes Whitmore (2013). There are many strains of Rhodes grass and some of them are great in pasture lands and recover even when trampled. The germination of its seed takes very less time ranging from 1-7 days and it spreads to large areas by three months thereby proving beneficial to farmers when they want to cover their bare soil. Besides being able to grow in drought conditions, Rhodes grass shows good tolerance to salt in the soil too thereby proving to be the best option for forage in tropical and sub-tropical countries and in places with saline soil. It needs good amount of sun as it doesn't thrive in shade. Though it can survive floods for about 15 days, waterlogging over 30 cm can kill it.

Use of Rhodes grass in Oman and in general

The primary use of Rhodes grass in Oman as well as in other countries is to be given as fodder for the livestock. Many farmers grow Rhodes grass when their soil conditions are poor due to its high survival rate and sell the grass as a fodder in the market according to Dutton (2013). Rhodes grass is also grown to hold on the soil and protect it from erosion thereby helping farmers to maintain their soil quality for cultivating desired crops. Rhodes grass is dried to convert it into hay and made available for cattle during dry seasons when pastures do not have much grass to eat. The hay is of more nutritive value when the grass is cut and dried before flowering takes place as per FAO (2016). Rhodes grass is good as livestock fodder due to its high protein content (9-12%) according to Arshad (2015). Oman exports the surplus hay of the Rhodes grass writes Oxford Business Group (2016). Rhodes grass is also combined in association with other crops like legumes, alfalfa in order to improve their yields according to Feedipedia (2016).

Farming methods of Rhodes grass in Oman

Prior to sowing the seeds of Rhodes grass, the land is ploughed to remove any weeds and stones which can hamper the spread of the grass roots upon germination. There after the seeds are evenly sown not too deep and the land is levelled to prevent water logging and rotting of the seeds. Since alfalfa is also quite popular in Oman, traditional hand cutting methods which were used for it were also used for Rhodes grass. But this method is not advisable for Rhodes grass as it then cuts the stolons and prevents further propagation of the grass naturally during the next season thereby reducing the yield according to Dutton (2013). For Rhodes grass, harvesting using mechanical cutters are encouraged by MAF and if it is not possible, light hand cutting is enforced in farms by training labourers. Since Rhodes grass requires nitrogen, potassium and phosphorus, fertilizers are used at fixed rates and intervals for a good crop. Since there is shortage of fresh fodder during non-monsoon seasons, farmers are encouraged to produce Rhodes grass to its peak in summer and made into hay by drying the grass for one or two days under the summer sun and stored for use during shortage of fresh grass. Getting peak yields in summer season is dependent on proper irrigation management techniques writes Dutton (2013). Sprinkler based irrigation methods have proved to give the best yield of Rhodes grass, however, it has also caused reduction in water levels and increase in soil salinity in the coastal areas necessitating the government intervention to move Rhodes grass cultivation to develop alternative areas in the Najed to meet the demand for fodder states Ishag (2015). Irrigation is done only after the rainfall ends as excess waterlogging can cause harm to the seeds of Rhodes grass. Modern irrigation techniques are used in the commercial farms of Batinah region for production of Rhodes grass.

C. Weeds in Rhodes grass

Definition of weeds

Weeds in crops have been in existence since the beginning of farming and losses to crops due to weeds has been happening due to them. It is difficult to estimate the exact losses to crops worldwide due to weeds, but all farmers worldwide accept that weeds are a problem just like pests which attack and spoil the crops. There is no one clear definition for a weed. It can be defined as an undesired plant which grows in an unwanted place where man wants to grow something else, or a plant of no known value or use to humans, which grows wild and hinders the growth of plants desirable by humans writes Zimdahl (2013). However, weed scientists have argued that not all weeds are useless, many act as food and medicine for livestock. Applying Darwin's theory of survival of the fittest, weeds have evolved and thrived successfully amongst the different environmental disruptions created by humans to meet their food and livelihood needs. Weeds continue to interfere with crops grown by humans and interfere in activities of mankind, but only in rare cases cause physical harm to the humans according to Zimdahl (2013). Weeds are associated with the words "to be controlled" and "visually unappealing", but scientists argue that weeds have ability to act as natural restorers of the soil impacted by man-made constructions as well as by natural disasters like floods, forest fire and stabilize the ecological impact says Zimdahl (2013).

Types of weeds in Rhodes grass in Oman

A research study showed that in the Dhofar regions where Rhodes grass is cultivated, a high number of weeds are present in fodder forms, but tend to be short-lived due to the farming practices of ploughing says El-Sheikh (2013). Primarily weeds from the family of *Cynodon dactylon* (Bermuda grass) and *Sonchus oleraceus* (sow thistle) cluster grow in the fodder farms

of Oman and these weeds are primarily of the annual type. Bermuda grass itself is used as a fodder, but it is also a weed of one kind as it cannot be removed easily and makes management of arable land difficult. Hence it becomes a strong competitor for Rhodes grass if not removed prior to sowing Rhodes grass seeds says Dutton (2013). Sow thistle too is a weed which spreads easily and also acts as a fodder, but if present along with Rhodes grass, it tends to deplete the nitrogen levels in the soil thereby threatening the growth of Rhodes grass according to Dutton (2013).

Disadvantages of weeds

Weeds are very often categorized as troublesome plants which can harm the crops, people, animals and even the environment in some cases. For crops weeds are a disadvantage because the weeds compete with the crops eating into their share of soil nutrients, water and even light which can lead to total crop failure if the weeds are not controlled at the right time. When weeds grow in cultivation areas, extra costs are to be borne to protect the crops because a variety of diseases, insects and nematodes are harboured by weeds who use them as alternate hosts to reproduce and spread. These in turn get transmitted to the crops causing variety of plant diseases like wilt diseases, stem rust, leaf spots, stalk rot, powdery mildew to different vegetables and fruit crops and even impact fodder crops say Zimdahl (2013). Some weeds in turn can hybridize with cultivated plants to produce new weeds and propagate rapidly in the place of the cultivated plants. For example, Johnsongrass hybridizes with sorghum to form a new weed, the shattercane. Another common problem is the seed of weeds get docked into seeds of grains and bring down the quality and pose difficulties in cleaning the grains. Wild oats and onion spoil the taste of wheat and barley which in turn affects the taste of food products made out of them. Some weeds cause harm to the animals which feed on them by causing poisoning or reducing the correct

nutrient intake thereby affecting milk quality and quantity, skin quality impacting wool, leather quality and even impacting animal's reproductive systems in some cases. Arrowgrass, buttercup, horsetail and larkspur are some of poisonous weeds which when eaten by animals causes diarrhea, nervousness, breathlessness in them according to Zimdahl (2013). Another disadvantage of weeds is that controlling them leads to increase in crop production and processing charges. If weeds were not there, there would be no need to invest in hoeing, herbicides, land tilling, cleaning of grains to search for weed seeds. Weeds also lead to wear and tear of harvesting machines due to the extra weight of weeds among the crop plants. Weeds impact the water management plans in agriculture as weeds consume the crop water, block the water flow in the irrigated land which in turn gets evaporated leading to water loss. Research indicates that floating weeds decrease water flow by 2 times while submerged weeds decrease the water flow up to 20 times causing serious effect to the cultivated crop and preventing farmers from supplying water to distant fields says Zimdahl (2013). Weeds also cause different types of allergies in humans like watery eyes, itches, sneezing and dry weeds are main sources of fires in the summer season. The fire spreads rapidly among the dry weeds causing harm to both property and lives. Weeds also force land owners to sell their lands for a lesser value due to decrease in options of items which can be produced on the land in the presence of weeds. Lastly, weeds decrease the aesthetic value of a place by making it look unmanaged and contributing towards accidents where they tower high due to lack of open space visibility and difficulties to walk and drive in the infested land.

Reasons of weeds distribution

There are many reasons for weeds being distributed across different habitats, even in an environment unsuitable to most other plants. Weeds seedlings grow rapidly and reproduce in a

very short time observes Zimdahl (2013). They mature quickly and can start flowering and producing mature seeds in as less than 2 weeks. Most of the weeds have dual modes of reproduction by seed as well as vegetative and can tolerate different climates. Unlike crop seeds which rot if not germinated as early as possible once placed in soil, weed seeds can lie dormant waiting for the most favourable environmental conditions to germinate. Weed seeds being many a times of the same size and shape as crop seeds, many a times humans involuntarily end up distributing the weeds themselves while planting crop seeds. These weed seeds when become plants, produce seeds in much greater numbers leading to further growth and distribution of weeds across distances due to short-range and long-range of seed dispersal methods says Zimdahl (2013). Weeds are resistant to control methods like herbicides and are great competitors when it comes to snatching their share of nutrients from plants growing along with them by using different methods like climbing and develop adaptations like thorns, bad odour and taste to prevent becoming a fodder for animals. Their roots are able to penetrate deep into soil layers and survive even when cut thereby proving to be disadvantageous to the crops growing along with them.

Impact of weeds on Rhodes grass

Rhodes grass seedlings have weak roots and hence cannot compete with full grown weeds and hence need weed control during the sowing stages according to Dutton (2013). However, once the seedlings grow, they surprisingly overcome and outgrow the weeds and spread rapidly. Hence there is not much impact to full grown Rhodes grass from weeds as much on its seedlings.

Negative relationship between weeds and Rhodes grass

Weeds and Rhodes grass compete for the same resources in the soil and hence if Rhodes grass seeds are sown in a weed infested land, it cannot compete with the weeds for the resources and

the crop is poor. However, weeds and Rhodes grass can easily co-exist once the Rhodes grass grows. The herbicides sprayed in order to control the weeds can change the taste of the Rhodes grass to some extent, but there is not much evidence to support it says Dutton (2013).

Effect of weeds on Rhodes grass production

Research has shown that weeds tend to affect the production of alfalfa and Rhodes grass in Oman according to Dutton (2013). However, Rhodes grass has proven to be more resilient to weeds in comparison to alfalfa if proper sowing, irrigation and harvesting methods are followed thoroughly.

D- Current management methods for weeds in Rhodes grass

In Oman

In order to tackle the problem of weeds while growing the dominant fodder crops of alfalfa and Rhodes grass in Oman, the farmers rotate the crops in some areas. After alfalfa is harvested, the land is broken up using a rotovator and the weeds are removed before Rhodes grass seeds are sowed. Studies indicate that since Rhodes grass require nitrogen fertilizers, it grows faster than the weeds and subsequently overshadows them thereby checking the weed growth due to competition for the same resources from the soil according to Dutton (2013). Herbicides are much costlier than rotavating, but if the infestation of weeds is across a large area, farmers use Combi-U46 for weed control twice a year say Breazeale, Khan, Al-Saadi, & Curtis (2007).

In the world

Since weeds can deplete the soil of its nutrients and take away share of Rhodes grass's moisture and light leading to poor yield, in Australia, the soil bed is ploughed before the seeds are sowed. When the soil is ploughed, the weeds are removed by their roots thereby reducing their

population and making space for Rhodes seeds to germinate and grow to their maximum height. Food and Agriculture Organization of the UN too recommends putting in efforts to reduce the weeds present before sowing itself through mechanized methods of spraying herbicides to destroy the weeds prior to starting the seeding of Rhodes grass according to as per FAO (2016). Despite weed removal during land preparation stage itself, weeds do emerge when the grass grows. However, since Rhodes grass has the ability to overcome the weeds, in Australia light grazing by cattle is followed once the crop grows as per Queensland Government (2013). For broad-leaved herbs, selective herbicides are sprayed, and extra care is taken if the Rhodes grass crop is along with other leguminous crops in order to avoid side effects of the herbicides. However, after this a light dose of nitrogen fertilizer is sprayed after this to strengthen the Rhodes grass crop.

Future research needs

Once mature, Rhodes grass is able to compete with weeds. However, during the land preparation stage, proper weed control is needed to ensure that there are no weeds to compete with Rhodes grass seedlings. Though Rhodes grass requires less water compared to other crops, water being scarce in Oman, contention for water cannot be afforded in any form of agriculture. Further research is needed to determine if there is indeed economic loss to Rhodes grass crop due to weeds, since studies have revealed that mature Rhodes grass are strong and are able to survive in their competition with other weeds.

E- Conclusion

Abstract

Rhodes grass being perennial, highly nutritious, resistant to drought and strong enough to survive weeds, is an ideal fodder crop for the increasing food demands of an increasing livestock in Oman. However, since it requires more water than the available natural water in Oman, it needs to be cultivated using modern irrigation practices like sprinklers which optimize the water consumption by the crop. In such a situation, weeds which are unwanted plants can be an overhead for the farmers due to it competing with Rhodes grass for water and other resources from the soil and hence need to be controlled. Bermuda grass and sow thistle were found to be present in fodder crop lands according to a research and both these weeds tend to spread rapidly. Weed control is necessary to achieve the maximum yield of Rhodes grass in the summer season so that it can be converted into hay for winter use. Hence land preparation through ploughing is the major activity in Rhodes grass farming in order to clear the land from any weeds. This important step prevents weeds from snatching away vital resources from the weak Rhodes grass seedlings and lets them become strong enough to outgrow the weeds. Hence extra care is essential during the initial stages of Rhodes grass farming in order to prevent weeds from causing a poor crop.

Recommendations

Since Rhodes grass needs nitrogen fertilizer, providing the right dosage at the right time is the best way to ensure that its seedling survives any weed scare and leads to optimum production. Potable water being scarce in Oman, the government should make attempts to achieve the right mix of fertilizers, land preparation and herbicides is used along with modern harvesting methods so that the weeds growing along with Rhodes grass do not propagate as rapidly as the grass. This

will give ample Rhodes grass yields, enough to meet the annual demands of livestock fodder as well as give Oman an opportunity to continue to earn money through its exports. Study should also be made of the best practices used by different countries like Australia where Rhodes grass farming is popular and attempts should be made to minimize the spread of weeds in its area to prevent drop in quality of the Rhodes grass.



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