American Journal of Environment and Sustainable Development
Vol. 3, No. 1, 2018, pp. 6-12
http://www.aiscience.org/journal/ajesd

Problems of Date Palm Production in Nigeria

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Abstract

Nigeria has vast land mass and suitable climatic condition to produce date palm in large quantities. However, date palm production in Nigeria is low and it becomes difficult for the industry to perform its statutory role to promote economic development. The study identified the problems confronting the Date Palm industry and proffer solutions to them. The problems identified by the study include lack of government assistance in term of loans, inputs, low budgetary allocation and lack of land to cultivate Date palm. Others were pest and diseases, poor extension services, lack of planting materials, sex identification and lack of knowledge on the numerous uses of date palm. The study recommended that government should assistant the farmers to get loans to buy input like fertilizers, insecticides and pesticides. Government should acquire large hectares of land that will be designated for date palm production as well as increase budgetary allocation for date palm research. Extension system should provide information on the importance and uses of date palms to the farmers. Date palm farmers should form functional date palm cooperatives society to get assistance from government and commercial banks.

Keywords

Date Palm, Production, Problems, Solutions, Economic Development

Received: February 26, 2018 / Accepted: March 22, 2018 / Published online: May 28, 2018

1. Introduction

Date palm (*Phoenix dactylifera* L.) is one of the oldest cultivated plants [19], [12]. The exact origin of the date palm *(Phoenix dactylifera* L.) is considered to be lost in Antiquity. However, it is certain that the date palm was cultivated as early as 4000 B.C. since it was used for the construction of the temple of the moon god near Ur in Southern Iraq - Mesopotamia [8], [9] and [12]. Dates and date palms were mentioned in the three most recognized religions in the world of Jewish, Christian and Islam.

Dates are produced in hot arid regions of the world and marketed worldwide as a high value confectionery and the fruit crop remains an extremely important subsistence crop in most of the desert regions [3], [19] and [11]. A desert environment is typically ideal for a date palm tree to grow in [19]. The tree can usually withstand hot temperatures and generally does not wither when placed in direct sunlight, though it normally perform well in an oasis setting because there is often an ample supply of water for the roots to soak up [4] and [11].

Nigeria has a vast land mass and suitable climatic condition to produce date palm in large quantities considering the fact that it has two fruiting seasons in a year. It grows in all the states of the federation but will perform better and produce fruits in the guinea and Sudan savanna vegetation that span across 15 states in the Northern part of the country [11]. Date palm provides food, shelter, timber products and all the parts can be used. Date palm fronds are used to produce brooms, baskets, ropes and mats, date palm fruits are used for breaking fast during Ramadan, medicinal uses as well for making syrups, sweeteners, snacks and juice [11], [10].

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The date palm could be a good source of food of high nutritional value, and due to its dietetic values it has always been held in high esteem by people compared to other fruits and foods. Date gives 3,000 calories per/kg as against apricot: 520 calories/kg; banana: 970 calories/kg; orange: 480 calories/kg; cooked rice: 1,800 calories/kg; wheat bread: 2,295 calories/kg; meat (without fat), 2,245 calories/kg. [16]. Similarly, the sugar content of a date fruit is almost entirely of the inverted form (namely glucose and fructose) which is important for persons who cannot tolerate sucrose. The flesh of dates contains 60 to 65 % sugar, about 2.5 % fibre, 2 % protein and less than 2 % each of fat, minerals, and pectin substances [16].

The date palm also play an important role in the ecology of various desert and semi-desert environments by provide a shelter to the ground thereby helping to protect the soil against harsh weather, control erosion and improve the soil fertility by conserving water. Because of these qualities date palm has been an important cash crop in the region where they are found in Nigeria.

1.1. Statement of Problem

Despite the advantages that the country has in the production of dates and the capacity of the crop to provide income, raw materials, food and foreign exchange earnings for the country [12], the production of Date palm in Nigeria is low [11], [10]. Thus, it is becoming difficult for the industry to perform its statutory roles. Most of the major Date producing countries have steadily expanded production over the last 10 years, representing a 43 percent increase over the period 1994 to 2001. Over the same period, Date exports increased by only 25 percent. This increase has been rapid in Oman, the United Arab Emirates, Egypt and Pakistan. [3].

Nigeria as it is currently a net importer of Date palm fruits to meet local demand due to many problems affecting Date palm industry in the country. There is therefore the need to investigate the problems affecting the production of Date palm in the country in a holistic way to proffer solutions to them and to serve as an entrepreneurial kit tool to make informed decision to move the industry forward.

1.2. Objective of the Study

The main objective of the study was to examine the date production in the country with a view to identify the problems affecting the industry and proffer solutions to them. The specific objectives of the study are to:

1) highlight the problems confronting date palm production in the country;

2) proffer solutions to the identified problems

2. Methodology

The study was achieved through review of literature on date palm from NIFOR in-house research review articles, journals, conference papers, FAO statistics, use of participatory tools like observation and the authors' field experiences.

3. Result and Discussions

The study adopts the categorization of the problems on the basis of the following sub-headings: socio-economic problems, biological factors, problems of conducting research and extension and agronomical problems.

3.1. Socioeconomic Problems

3.1.1. Lack of Government Assistance

There were complains of lack of government assistance by farmers in the country in term of farm inputs such as improved seedlings, fertilizers, pesticides, loans and insecticides. According to [14] lack of government support (54.4%) ranked second after lack of land (81%) by oil palm farmers. Palm tree crops like date are capital intensive to establish a plantation. The farmers have lots of things to contend with in term of land acquisition, land clearing, acquisition of seedlings and field establishment. There is the need for government assistance to reduce the burden on them to serve as motivation for date palm production. Government should assistance the farmers by provide money and subsidize inputs such as seedlings, fertilizer and insecticides as a deliberate government policy is desirable to encourage date palm production in the country.

3.1.2. Lack of Capital

The major source of money to date palm farmers is personal savings and lending from relatives or money lenders [11]. The money gotten from these sources is very inadequate to run date palm plantation that is necessary to bring about increase in date palm production in the country. Money is required for acquisition of large land, land clearing, acquisition of seedlings, field establishment, plantation management and harvesting the fruits. This is a huge sum of money which cannot be raised by personal savings and lending from relatives or money lenders which are the main sources of finance to date palm farmers [11]. The commercial banks that would have assisted are not ready to put their money in a long time investment like date palm plantation. There is therefore the need to inject more money into date palm production by commercial banks and government by giving the farmers loans through their cooperative societies.

3.1.3. Lack of Awareness on the Importance of Date Palm

The importance and the many uses to which date palm can be used are not known by the people. Date palms have lot of uses from environmental, economic, social, medicinal and industrial. Environmental, it can be used as a shelter belt to protect the land against harsh weather like excessive heat, erosion, climate change mitigation, mulching the soil to conserve water and adding mineral nutrient to the soil. Economically, it serves as sources of income to the farmer when any part of the tree is sold.

3.1.4. Land Tenure System

Land tenure system is a serious problem affecting date palm production in the country. According to [11] the majority of the respondents representing 95.7% in their study area have a farm size of less than 4 hectare that is not adequate for date palm plantation. The land owned by the farmers are scattered everywhere as a result of land tenure system whereas date palm plantation required a large expanse of land and not scattered plots of lands. [14] also noted that land (81%) is a major problem confronting palms production.

3.1.5. Lack of Date Palm Farmer Association

There are no well-established date palm farmers' association in the country to really fight for the course of their members like Rice farmers' growers association, palm oil farmers' association and cocoa farmers' associations. According to [13] the majority of the respondents (94.8 %) are not involved in any cooperative activities. This is a serious problem as the date palms farmers need to speak with one voice to make the government know their problems and to collectively solve them. Similarly, it is easier to work with a group than an individual as government and development partners like non-governmental agencies and commercial bank are confortable working with groups.

3.1.6. Poor Market Structure

There is no adequate information on the price of date palm in the country. Market prices are needed to promote date palm production in the country. Good price will motivate the entrepreneurs or farmer to produce more date palm by establishing plantations to get more income. Farmers will be willing to produce date palm as long as they have good price for their commodities. In order to promote date palm industry in the country, there must be a good market structure where the entrepreneur will be able to get all the information he/she needs in term of inputs prices, credits and market price of date palm to make good managerial decision on when and how to produce or where and when to sell his/her produce to make maximum profit. This is a kind of market driven demand /supply which have been claimed to be self-sustaining, is what is needed in the date palm industry to move the industry forward.

3.2. Biological Factors

3.2.1. Date Palm Sex Identification

Sex identification is a serious problem affecting date palm production in the country as it is difficult to identify progeny from early stage especially when propagation is from seed. The current 50:50 male to female ratio should give way to 70-90 for female as the current ratio is not good for commercial date palm farming that ensure high profitability. The sure bet to overcome this problem is propagation through tissue culture and offshoots. Tissue culture techniques for date palm, also called *in vitro* propagation, has many advantages of propagation of healthy selected female cultivars (disease and pest-free), Bayoud resistant cultivars, or males having superior pollen with useful metaxenia characteristics which can easily and rapidly be propagated, large scale multiplication, no seasonal effect on plants because they can be multiplied under controlled conditions in the laboratory throughout the year, production of genetically uniform plants and economically reliable when large production is required [17].

Date palm growers are encouraged to use tissue culture-derived material of known varieties with high date quality and marketing potential [17]. The Nigerian Institute for Oil palm Research (NIFOR) has started work in this regard and very soon the progenies generated will be sold to the farmers. Offshoot propagation, also called asexual or vegetative propagation, offers the following advantages of the plants that are true to type to the parent palm, consequently the fruit produced will be of the same quality as the mother palm and ensures uniformity of produce and will bear fruits 2 - 3 years earlier than seedlings [17]. Propagation through offshoots and tissue culture can guarantee the sex of the progenies that will be used to establish the plantation, hence the farmer will be able to make the right decision on the number of female he/she want to plant from the onset.

3.2.2. Lack of Improved Planting Materials

Both information on how to and where to get improved planting material is not known to date farmers. The unavailability of improved planting material has been identified as one of major problem confronting date palm production. According to [1] most date palm farmers source for their seedlings personally (47%) while others source through other farmers (21.7%), NIFOR date palm sub-station (20.9%) and Jigawa State Agricultural development Agency (JARDA) 10.4%, meaning few percentages obtained their seedling from relevant research institutes which may have

negative implication on sustainable production of date palm in the country. NIFOR Date palm sub-station is the only accredited research institute in the country that are saddle with research on date palm and apply the research findings to produced seedlings for sale to the farmers. This information will be relevant for entrepreneurs or farmers that want to establish date palm plantation in the country to go to NIFOR Date palm sub-station, Dutse, Jigawa State, Nigeria.

3.2.3. Diseases and Pests

There are many diseases and pest affecting date palm. The noticeable ones are Belâat disease, Lethal yellowing, Blacknose, Graphiola leaf spot, Brown leaf spot, Black scorch and Bayoud disease for diseases while the pests are Red palm weevil and African palm weevil, Termites (*Microcerotermes diversus*), *Rhinoceros beetle (Oryctes rhinoceros Linné),* Caroub moth, Red scale (*Phoenicococcus marlatti*. Cockerel) and *White scale* [18]. This space will not be enough to discuss all the diseases and pest in detail but effort will be made to discuss the general control method for the diseases and pest.

Control measures for diseases include good sanitation such as pruning of the affected fronds, leaf bases, inflorescences and the plants, immediately collecting the items and burnt coupled with treatment with Bordeaux mixture or any large spectrum fungicides, disinfecting all tools during pruning or cutting when removing the offshoots and cut surfaces; chemicals such as Bordeaux mixture, lime-sulphur solution, copper sulphate lime mixture, dichlone, thiram or any new copper-based fungicides should be sprayed to protected the prune cuts and surrounding tissues; Prophylactic measure is essentially to prevent the movement of contaminated plant material from an infected palm grove to a healthy one and genetic control as the only productive means of controlling bayoud disease which lies in continued research into resistant varieties from three sources: selection of bayoud-resistant varieties from those already existing (local and introduced), selection of high-quality, and resistant clones from the natural population of the date palm, and creation of resistant and high quality varieties through a hybridization programme [18]. Genetic tolerance has been found in some varieties such as Barhee, Adbad, Rahman, Gizaz, Iteema, Khastawy, Jouzi and Tadala, while the following control measures are highly recommended for the pests affecting date palms; quarantine, plantation sanitation, chemical treatment, regular surveys, pheromone mass trapping and the use of nematodes as a biological method [18]. This small piece will be informative to farmers on how to tackle such problems when they occur on their farms.

3.2.4. Long Gestation Period

Long gestation period is another issue affecting date palm production in the country. There is no sensible entrepreneur that will want to invest in a venture that has long period for him/her to recuperate their money. There is also a usual saying that the person that plant date palm is not the one that will reap the benefit. These undoubtedly discourage whosoever wants to embark on date palm production. All these are no longer a problem as research has advanced beyond that and the person that plant date palm can start to generate income from the third year of establishing the date palm plantation. Date palms from NIFOR Date palm sub-station have proven to start fruiting from 3-5 years from the date of establishment on the field with good agronomical practices [7]. This should encourage the people that have erroneous believe about date palm to have a rethink and invest in the date palm plantation to boost date palm production in Nigeria.

3.3. Problems of Conducting Research and Extension

3.3.1. Lack of Fund to Carryout Comprehensive Research on Date Palm

The budgetary allocation in the country to date palm research is inadequate to carry out research in our universities and research institutes. For instance, date palm research is under the Nigerian Institute For Oil palm research (NIFOR) where it compete with the other institute's mandate crops like oil palm, coconut, raffia palm, Shea tree and other palms of economic important for the allotted budget of the institute. How can a comprehensive research be carried on date? The institute did not have enough resources to carry out their function of generating technologies on date and transferring the technologies to the farmers. There should be collaboration between NIFOR Date palm Sub-station and date palm catchment Universities areas of the country to work together as a team, set research priority and pooling their resources together in order to achieve higher degree of success as compared to doing the work individually with their small budgets. Similarly there are lot of technologies that have been developed by NIFOR that are yet to be taken up by large corporate organizations like the date palm juice. There is therefore a need for collaborative efforts between the research and development partners including the private organization and non-governmental organizations as government alone cannot do everything.

3.3.2. Poor Extension-Farmers' Linkages

There has been poor linkage between the research and the farmers. There are lot of researches that have been developed by research institutes and the University that are yet to get to the farmers because of the poor extension network in the country. According to [11] date palm farmers ranked

extension agent (66.1%) as second after friends/relatives (73%) and closely followed in third position by radio (50.4%) as source of information on date palm. This shows that date palm is not given adequate attention in extension programme as many farmers seek for information from friends and relatives. Similarly, there is no coordination between the research institution's extension units and the ministry extension components that get to the farmers. This problem is usually aggravated by conflict of interest of the two extension units. The research extension component will be promoting researches of their mandate crops which may not be in the interest of the ministry that have other crops to promote. This is not working well for the date palm in the country as effort should be made to promote date palm production in the country. In addition the rivalry between other researchers in the research institutes and the extension scientist in the research institutes should be addressed so that researchers and extension scientist should see their selves as partners in progress rather as rivals. Researchers on date palm should not hoard research findings from the extension scientist and the extension scientist should research on the need of the farmers, interact with the researchers to set the institute's priority on date palm that will move date palm industry forward.

3.3.3. No Comprehensive Programme for Date Palm in the Country.

There is no clear road map for date palm development in the country. In order for any progress to be achieved, there must be a roadmap that needs to be followed meticulously. All the stakeholders must play their roles according to the script, research should generate enough technologies for the date palm industry, extension agents to transfer the technologies to the farmers, farmers should adopt the technologies and companies should exploits the available technologies to produce date products that will serve as market driven demand that ensure the sustainability of the industry.

3.4. Agronomic Factors

3.4.1. Poor Nursery Management

Research shows that nursery management technologies utilization was low. According to [1] farmers shows low level of utilization of the following nursery practices; sprouting seeds, planting sprouted nuts, mulching and bagging of soil. This means that the farmers do not necessarily engage in nursery practices, they plant their date palm seeds directly on the field to grow by chance which did not guarantee the survival of the plant. For tree crop like Date palm to grow well it need to be tended at the early stage of its existence. This also ensures that the date palms mature early. Date palm sprouted seedlings are available at NIFOR date palm sub-station Dutse, Jigawa State for any farmer that want to embark on large scale date palm farming and training on other nursery management such as fertilizer and farmyard manure recommendation and application.

3.4.2. Lack of Knowledge on Plantation Management

There are many management procedures that the farmers are not aware of. In order to get a good yield from date palm farming, the farmer must have knowledge on sex identification of the palm on the field, pest and disease control, pruning technologies, ring weeding around the palms. A good farmer must be able to identify the sex of its palm has soon as they start to flower between 3-5 years of planting. As discussed earlier, it is difficult to know the sex of date palm at seedling stage except the seed is generated through tissue culture technology and offshoots. So the farmer need to know the sex of the palms and ensures that the female palms are more than the male palms in order to get a high yield. The farmer can decide to cut down the male if they are too much and replant to increase the female palms. There is the urgent need to control disease and pest immediately on the farm. For instance *oryctes monoceros* can cause 40% loss on annual production yield in tropical Africa [2].

Ring weeding around the palm is very important because it helps to reduce weed competition with the palm and ensure enough nutrients are available for the palm as well as allow water and air peculation into the soil for the palm use. Pruning technique is another important management that ensures high yield. The farmer must not over prune the palm fronds on the palm. It is recommended that only died or old fronds should be pruned. The functional value of the leaf to the palm declines with age and no two leaves are the same age. Furthermore, leaves which are four years old are only about 65 percent as efficient in photosynthesis per unit area, compared to leaves of one year old, under good cultural conditions a leaf can support the production of 1 to 1.5 kg of dates [15]. In order to allow for uneven pruning at the base, counts could be made on opposite sides and divided by two. This technique will allow the grower to calculate the total number of leaves on the palm. A ratio of 8 leaves per fruit bunch will indicate how many bunches to leave on that palm [15].

3.4.3. Lack of Knowledge on Post-Harvest Technologies and Other Uses to Which Date Fruit can Be Used

There are lots of date palm fruits that are loss every year particularly during wet fruiting seasons because there is no enough sun to dry the fruits and partly to lack of post-harvest technologies in term of handling and processing. Date palm has three stages of maturity: khalaal, rutab and tamr that are

distinguished based on water and sugar level. During the raining season, the fruit can only get to the first maturity stage of khalaal characterized with moisture content: 50 - 85 %, bright yellow or red in colour, hard and crisp, perishable and less sweetness [6]. Because of high water level they tend to have low shelf life. There is the need to refrigerate the fruit and take them to the market on time or process them to wine or juice. Rutab, the second maturity stage are partially browned, reduced moisture content (30 - 45 %), fibres softened and perishable [6] and can be treated like the khalaal stage because of high water content. Tamr stage have characteristic colour from amber to dark brown, moisture content further reduced (below 25 % and down to 10% and less), texture from soft pliable to firm to hard, when protected from insects it can be kept without special precautions over longer periods [6]. Damaged tamr can be pitted to form a kind of pastes that are used to make snacks, pastry, sweeteners and syrups in confectioneries and pharmaceutical industries respectively. Date palm fruit can also be used to make juice. The knowledge of post-harvesting technologies and other forms to use the fruits will help to reduce the losses and serve as a motivation to produce more date fruits for consumption.

3.4.4. Lack of Knowledge on Pollination Technologies

This is essential to increase yield of date palm in the field. This requires human assistance. According to [5] for fruit setting, fertilisation of the female flowers by male pollen is required, which in date palm cultivation is not left to the wind or insects but is done traditionally by man by inserting a piece of a spikelet of male flower at the moment of the opening of the female flowers or more modern methods by collecting the pollen from the males and in combination with a carrier (such as flour) will be dusted on the female flowers with a mechanical device. It is also noteworthy that the female flowers are not produced or do not mature at the same time hence special effort is required. Even on one particular bunch, ripening will usually start from the lower end of the hanging bunch going upward. This means the grower will be required to climb his palms more than once for each operation, e.g. at least 3 times for pollination [5].

3.4.5. Lack of Inputs

There are lack of inputs that are required for improving the performance of date palm trees and yield. Inputs such as pesticides, improved seedlings, fertilizers and farmyard manures are not available and if available are very expensive to buy. Government should assist the date palm farmer through subsidizing farm inputs such as fertilizers, pesticides, seedlings.

4. Conclusion and Recommendations

Date palm is in a position to provide food, income, foreign exchange and employment to large number of people in the date palm producing area of the country. Government assistance in term of loans to the farmers through bank of agriculture to help solve the problem of lack of capital that will assist the farmers with money to buy input like fertilizers, insecticides and pesticides to improve the yields and control the diseases and pests affecting date palm and also subsidizing the inputs used for producing date palms. In addition commercial banks should give out loans to the farmers to solve the problems of low capital, lack of inputs caused by lack of money. Government should acquire large hectares of land for date palm production to solve the problem of land tenure system affecting the establishment of plantation.

Similarly, government should increase budgetary allocations to the research institutes to solve problems related to research particularly in the area of funding tissue culture research that is cardinal for the development and supply of improved seedlings to the farmers as well as solve the problem of lack of improve planting materials and sex identification. Research institutes should increase their budget allocation to date palm programme to carry out research on tissue culture, agronomical practices that will increase date palm production and motivate the farmers to cultivate date palms and also generate post-harvest technologies to reduce wastage of date palm fruits. Researchers should collaborate with scientist of different discipline to develop comprehensive programme for the date palm tree.

Extension system should rise to the occasion by providing information on the importance and numerous uses of date palms to the farmers and the general public on the benefits and need to embrace date palm plantation. Similarly, extension service should provide information on where to buy improved seedlings and market price of date fruits to stimulate production of date palm in the country. Lastly, there is the need for the date palm farmers to form functional date palm cooperatives society like that of cocoa, palm oil and rice farmers associations which is a veritable avenue to get assistance from government and commercial banks to increase date palm production in the country. Extension agents should encourage the farmers and facilitate the formation of functional date palm farmers' association. The article will be informative to extension specialists, date palm growers and any entrepreneur interested in the date palm production in the country and will serve as kit tool to make a good decision on best practices to follow in order to move the industry forward.

References

[1] Adesiji, G. B., Olujide, M. G., Bolarin, O., Sanusi, M. K. and Komolafe, S. E. (2013). An assessment of date palm technologies utilized by the farmers in Dutse Local Government Area of Jigawa State, Nigeria. *Journal of Sustainable Development in Africa.* Volume 15, No. 8. Pp., 11-20.

[2] Allou, K., Morin, J. P., Kouassi, P., Hala, N. and Rochat, D. (2006) "*Oryctes monoceros.* Trapping with synthetic pheromone and palm materiel in Ivory Coast". *Journal of Chemical Ecology,* Vol. 32, 1743-1752.

[3] Botes A. and Zaid A. (Ed.). (2002). The economic importance of date production and international trade. *Date palm cultivation*. FAO plant production and protection. Rome. Paper 156 Revision 1.

[4] Dada, M., Nwawe C. N., Okere, R. A. and Uwubanmwen, I. O. (2012). Potentials of Date palm tree to the Nigerian economy. *World Journal of Agricultural Sciences*, 8 (3), Pp.:309-315.

[5] FAO (2006): Date palm product. www.fao.org/dorep/t0681E/t08/E00.htm. Chapters 1-5

[6] Glasner, B., A. Botes, A. Zaid (Ed.) and J. Emmens. (2002). Date harvesting, packing house management and marketing aspects. *Date palm cultivation*. FAO plant production and protection. Rome. Paper 156 Revision 1.

[7] NIFOR In-house review article, 2005.

[8] Popenoe, W. (1913): Date growing in the Old and New Worlds. West India Gardens. Altadena, California, pp. 316. Cited in Zaid A. (Ed.) and De Wet P. F. (2002). Origin, geographical distribution and nutritional values of date palm. Chapter ii. *Date palm cultivation*. FAO plant production and protection. Rome. Paper 156 Revision 1.

[9] Popenoe, P. B. (1973): The date palm. Henry Field, ed., Field Research Projects, Coconut, Miami, Florida. pp. 247. Cited in Zaid A. (Ed.) and De Wet P. F. (2002). Origin, geographical distribution and nutritional values of date palm. Chapter ii. *Date palm cultivation*. FAO plant production and protection. Rome. Paper 156 Revision 1.

[10] Sanusi, M. K, Omokhudu, C. A. and Adeloye, F. F (2017). Date Palm Farmers' Sources of Information in Dutse Local Government Area of Jigawa State, Nigeria, *Journal of Agricultural & Food Information.* https://doi.org/10.1080/10496505.2017.1382363

[11] Sanusi M. K, Omokhudu, C. A., Bello, O. G., and Yahaya S. A. (2016). An Assessment of Knowledge Level of Date Palm (*Phoenix dactylifera L*) Farmers in Dutse Local Government Area of Jigawa State, Nigeria. *World Journal of Agricultural Research*, vol. 4, no. 2: Pp. 36-42.

[12] Sanusi M. K, Omokhudu C. A and Yahaya S. A. (2014) control of *oryctes monocros* on date palm field in Sudan-savannah vegetative zone of Nigeria. *World journal of Agricultural Research.* Vol. 2, no. 6, Pp. 285-290.

[13] Sanusi M. K. (2012). Assessment of date palm technologies utilized by the farmers in dutse local government area of jigawa state. Msc. thesis in the Department of Agricultural Extension and rural development, University of Ibadan, Ibadan, Nigeria. Pp. 1-30.

[14] Soyebo, K. O., Farinde, A. J. and Dionco-Adetayo, E. D. (2005). Constraints of Oil Palm Production in Ife Central Local Government Area of Osun State, Nigeria. *Journal of Social Science.* Volume 10 No.1: Pp.: 57.

[15] Zaid A. (Ed.) and De Wet P. F. (2002). Botanical and systemic description of the date palm. Chapter i. *Date palm cultivation*. FAO plant production and protection. Rome. Paper 156 Revision 1.

[16] Zaid A. (Ed.) and De Wet P. F. (2002). Origin, geographical distribution and nutritional values of date palm. Chapter ii. *Date palm cultivation*. FAO plant production and protection. Rome. Paper 156 Revision 1.

[17] Zaid A. (Ed.) and De Wet P. F. (2002). Date palm propagation. Chapter v. *Date palm cultivation*. FAO plant production and protection. Rome. Paper 156 Revision 1.

[18] Zaid. A. (Ed.), De Wet, P. F., Djerbi M. and Oihabi, A. (2002). Diseases and pest of Date palm. *Date palm cultivation*. FAO plant production and protection. Rome. Paper 156 Revision 1.

[19] Wisegeek, 2011. http://www.wisegeek.com/what-is-a-date-palm.htm