

## Weed control in onions (*Allium cepa*) production by small scale farmers in Nigeria

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### Abstract

Onion (*Allium cepa*) is considered as the most vital crop of Allium group. It is one of the most useful vegetable crops because it forms an indispensable part of many diets. It is considered as the friendly crop to both old and young. Onion is useful for its bulbs possessing characteristics flavour, odour and pungency. Onion has the ability to cure many ailments including stopping of bleeding, inhibiting human stomach cancer, curing sleeping disorders, etc. Onion is considered as a highly export vegetable crop and earns a reasonable foreign exchange for the country. Weeds which are worthless species of plants to the small-scale farmers are troublesome in onion production as they interfere with production of crop and add to the cost of the cultural practices involved in onion production especially in weeding. The lowering of onion yield has a direct relationship with weed competition. Weeds also reduce the quality of crop yield. Onion shows higher susceptibility to weed interference when compared with other vegetable crops owing to its characteristics like shallow roots, lack of dense foliage, slow growth, etc. The effective weed control in onion production include preventive, integrated, biological, mechanical methods, etc. The use of herbicides is also of great importance in weed control in onion production. Spraying of pre-emergence herbicides keeps the onion in weed free condition during the early stages and the use of post emergence herbicides are useful to reduce damage to the onion bulb, weed competition and cost of weeding.

**Keywords:** onions, small scale, farmers, production, Nigeria, weed, control

### 1. Introduction

Onion (*Allium cepa*) is also called a bulb. The common onion and garden onion are the most widely cultivated species of the genus Allium. Onion is one of the most vital commercial vegetable crops grown all over the world. In India, onion occupies about 1.08 million hectare areas having 16.15 million metric tonnes of production and average productivity of 15.3 metric tonnes per hectare (Warade *et al.*, 2006) [29]. Onion crop is slow growing, shallow rooted, narrow, upright leaves and non-branching habit. Onion crop does not compete well with weeds due to its growth habit. Yield loss in onion due to weed infestation is predominantly very pronounced, ranging from 45 to 85% (Channapagouder and Biradar, 2007) [12].

The conventional methods of weed control in onions are, hoeing and weeding, which are very laborious, expensive, time consuming and insufficient means of weed control. Moreover, weeding during critical growth stage is very hard owing to increased cost of human labours and its scarce availability. On the other hand, use of herbicide alone does not prove effectiveness for weed control due to their spectrum of weeds they can kill (Chamdrika, *et al.*, 2009).

### Importance of Onions (Nutritional Benefits of Onions)

Onion is valued for its bulbs having exotic odour, flavour and pungency which is due to the presence of a volatile called allyl-propyl-disulphide. Pungency is formed by enzymatic reaction when tissues are broken. Onions is used as salad and cooked in many ways in curries, fried, boiled, backed and used in making soups, pickles, etc. Value addition in onion is by marketing dehydrated onions and onion flakes. Onion bulb is rich in minerals like phosphorus and calcium. Many medicinal uses are reported for bulbs and is commonly used as diuretic and applied on wounds

and boils. Onion greens are also used by harvesting crop at pencil thickness and when small bulb is formed (Zohri *et al.*, 2005) [31].

Onion is a vital and indispensable vegetable crop and can be found in almost every kitchen in Nigeria and the world over. It is an important condiment and vegetable for Indians. The green leaves and bulbs are eaten either raw or used in the preparation of several recipes. It holds a great place in the Nigerian food market because of its special characteristics of pungency and indispensability. Onions are used in soups, sauces and for seasoning foods. The small bulbs and shallots are pickled in vinegar and brine onion is useful for the prevention of cardiovascular disease, especially as it lowers the risk of blood clots. Onion protects against certain infections and stomach cancer. It is useful in asthmatic treatment. The more pungent varieties of onion appear the more the possession of high concentration of health-promoting photochemical (Fukushima *et al.*, 1997) [14]. Other uses of onion are highlighted below according to Gafitaanu *et al.*, (2006). Include:

1. Cancer prevention
  - a. Studies have shown that the antioxidant as present in onions can protect us against cancer by reducing the DNA damage in cells caused by free radicals.
  - b. All onions and onion relatives (garlic, leeks, chives and scallions) are rich in organo-sulfur compounds, which have been shown to help prevent cancer
2. Onions are a very good source of vitamin C, B6, biotin, chromium, calcium and dietary fibre. They also contain a substantial quantity of folic acid and vitamin B1 and K.
3. Onions contain an enzyme called alliinase which is released when onion is cut and causes our eyes to water. This enzyme helps to clean the eyes and make it

work better.

4. They contain flavonoids which are pigments that give vegetables their colour. These compounds act as antioxidants, have a direct antitumor effect and have immune promoting properties.
5. Onions contain a huge quantity of sulphur and are especially good for lives. As a sulphurous food, they mix best with proteins as they stimulate the action of the amino acids to the brain and nervous system.
6. Onions are rich source of quercetin which thins the blood, lowers cholesterol, and prevents blood clots, fights asthma, chronic bronchitis, hay fever, diabetes, atherosclerosis and infections and it's specially linked to inhibiting human stomach cancer etc.

Other health benefits of this crop (Onion) are:

- a. A small piece of onions can work against the side effects of fever if it is kept on the forehead.
- b. A small piece of onion if inhaled can stop or slow down the bleed through the nose.
- c. It helps to give good night sleep.
- d. Onions help to improve digestive system. If we have digestion problem, then onions can cure it by increasing the release of digestive juices.
- e. Onions juice can cure burnt skin or an insect bite or a bee bite. It can cause a burning sensation when applied but can heal very effectively.
- f. Onions increase insulin in the body and also treat diabetes by controlling the sugar levels in the blood
- g. Regular consumption of onions leads to good memory and strong nervous system.
- h. Onions cure menstrual disorders. Raw onions should be eaten before a few days to a girl's menstruation cycle, etc.

### Small – Scale Farming in Nigeria

Small-scale farming in Nigeria is at a lowest level of recognition. Peasant farmers who are also referred to as small scale farmers are the engine room of agricultural production but their agro-activities are hindered by a number of challenges. Lack of certified seeds, poor soil fertility, lack of adequate plant spacing, low educational level etc effect the efficiency of their operation.

Wiro (2020) <sup>[1, 30]</sup> reported that most horticultural farmers utilize local varieties in crop production which negatively affect their production. Various government policies have reduced the operationality of small scale farmers in Nigeria. A challenging socio-economic problem is how the large number of Nigerian rural drivellers could be assisted in establishing reasonable rural livelihoods. Small scale agriculturalists have the potential to generate employment, food and income in potentially competitive agricultural practice and with proactive policy support, the opportunities opened for small scale farmers could be developed into great opportunities for a future small holder farmers.

### Defining a Small – Scale Farmer

A small – scale farmer is a farmer whose farming is done on a small holding. Level of operation is mostly for subsistence purpose. In Nigeria the concept of “small-scale farmers” is usually value-laden, creates wrong impression and is often viewed in a negative light. According to DeJanvry (2007), small-scale is often equated with a backward, non-productive, non-commercial, subsistence agriculture that are

found in parts of the farmer homeland areas. It is generally associated with farming where the necessary innovations, modern technology and techniques necessary for high productivity are lacking. They are viewed to lack the ability to become large-scale commercial farmers. Lack of finance, capital, skill, technology low level of education, poor soil status, environmental degradation and land tenure are among the factors that militate against the operations of a small –scale farmer in Nigeria.

### Benefits of Small – Scale Farmers

The small scale farmers perform the following functions:

1. Protection of communities togetherness and create jobs for many unemployed youths and adults in the various communities
2. They improve the health of the land by the addition of organic manure which improves the soil structure and hence productivity of crops. Adesina and Wiro (2020) <sup>[1, 30]</sup> stated that the addition of poultry manure caused a great response in Okra production which is one of the major crop by the small-scale farmers in Nigeria.
3. They improve the health of people
4. They provide a foundation for a more organized food production system in Nigeria.

With this definition, it is pertinent to examine how this group of farmers control weeds in onion production in Nigeria.

### Weed Control in Onions Production in Nigeria

For a decent description of the control of weeds in onions, it would be pertinent important to know the characteristics and economic importance of weeds.

### Meaning of Weeds

Weed are plants whose virtues have not been discovered (Ambe *et al.*, 2012) <sup>[3]</sup>. Weeds are plants that grow where they are not required for any purpose. They are plants whose unwanted desire outweighs their essentiality. Weeds are organisms that appear desirable by man at a particular period but discarded as worthless at another time. A weed is a plant with no distinct description. A farmer at any point in time decides what would be described as a weed because all weeds are plants. If an okra plant is growing in a cassava farm and the farmer liked it, thatokra becomes a crop but where the farmer did not desire the presence of the okra there, then the okra becomes a weed. There are over 140 plant species that are troublesome worldwide and are regarded as weeds. (Akobundu, 1987) Some of these troublesome plants (weeds) could be cultivated for the production of vital produce. Ansa *et al.* (2019) <sup>[7]</sup> stated that elephant grass which is one of the notorious weeds has for long been used as vital forage crop in tropics because of its high yields and nutrient value. Another vital beneficial use of elephant (*Pennisetum purpureum*) is its sustainability as desirable feedstock and ethanol production. Guinea grass also serve as forage crop for the feeding of animals. Some of the weeds are even used for medicinal purposes to treat various ailments. Results have shown that every crop has what is known as critical period of weed control. This is a period in the life span of the crop at which weeds must be removed (controlled) if the growth and yield of such crop must be maintained or remain uninfected (Season, 2009). The critical period of weed control is the key component of

an integrated management programme. It explains that period in the crop life cycle during when weeds must be controlled to prevent yield losses. It has been reported that keeping crops free from weeds during the critical control remove depression and infestation of the plant growth and encourage the yield of the crop due to the absence of the adverse influence of weeds (Wiro and Iyagba, 2020) <sup>[1, 30]</sup>. Keeping crops free from weeds promotes growth, development and yield.

Weeds are known as serious menace to the vegetative growth and yield of crops from the time of early man (Stall, 2009). Farmers are usually faced with the problem of weed management in the course of carrying out their agricultural activities and the competition of these weeds with the plants drastically diminish the growth, development and productivity of crops. Ibrahim and Hamma (2012) <sup>[17]</sup> reported that no weed control and less fertilizer application gave rise to low parameters values in the growth and yield of crops because of weed competition for soil nutrients, giving to weeds competitive benefits over the crops. Species of weed, density, agro-climatic conditions, the type of cropping (farming) system adopted, moisture content, soil type, crop growth pattern, climatic factors (rainfall, temperature, humidity, wind, pressure) determine the pattern of growth of weeds in an agricultural site. According to Lagoke (2000) <sup>[20]</sup>, research on elements affecting the co-existence and interference association between crop and weed is ejective to establish cultural activities to weeds interfere with the crops. Weed interference with crops reduce the efficiency of the production capability and potentiality of the crops, add to the cost of farm activities, lower the land value, harbour pest and diseases. The losses caused by the presence of weeds are observed worldwide and crop yield are negatively affected (Anderson, 2004) <sup>[4]</sup>.

### Crop - Weed Competition

Weeds compete with the cultivated crops. Competition is the struggle for existence and superiority over the available nutrients, space, air and water. A Competition exerts a powerful force in the plant community, tending towards limiting the weaker competitors. Competition is maximum when available resources for crop growth and development become limited (Callaway, 2012) <sup>[10]</sup>. Competition is a negative association where individuals make simultaneous demand that exceed limited resources and while one suffers, the other individual benefits. So, crop-weed competition indicate competition between crop and weed in a natural ecosystem in response to resources essential for their existence, superiority and survival. Competition occurs because resources are not enough for all the plants as is the case in every ecosystem.

Crop-weed competition has been on from time immemorial and will continue in as much as live exist. This competition has led to the reduction in the productive capability of which has put away many small scale farmers away from farming business due to the huge losses they incur. Wiro and Ansa (2019) <sup>[7]</sup> said that attractive harvest and high income generation from the sales of the produced crops encourages farmers to remain in farming activities. This means that infestation of crops by weed diminishes the interest of farmers in the farming operation. According to Nobel (2019), farmers are concerned with the effects of weeds on the overall performance of the vegetative yield of crops. This has led to several researches been conducted on the

possible ways to lower the effects of weeds on crop by providing more effective and efficient ways of weed management with a view to improving and increasing crop productivity hence the need for weeds control in onions by small scale farmers in Nigeria.

### Weeds Control in Onions by Small Scale Farmers in Nigeria

Before adopting any appropriate method for effective and efficient control of weeds, it is necessary to know about the weed seed dispersal, mode of propagation, crop-weed competition. Nature has provided weeds several devices that help them to be disseminated widely, water, wind and animals (man inclusive). Other means are impure seeds, sewage, organic manures, agricultural implements, and drainage water. The weed control methods can be broadly classified into two, namely: preventive and control methods (Jordan, 1996) <sup>[18]</sup>. Preventive measures include all such measures through which the introduction of weeds into the crop field could be avoided. Since weeds multiply at a much faster rate and harder than crop plants, they always have an upper hand if they are allowed to establish in the field. It is difficult and costly to eradicate weeds in the farm. The preventive measures include use clean (certified seeds which are free from weed seeds; use well decomposed cow-dung or compost, cut weeds before seeding, etc. Ansa and Iyagba (1999) identified various methods of weed control. They stated that the accepted methods include biological weed control, cultural weed control, chemical weed control, mechanical weed control and integrated weed control, preventive weed control and these measures are geared towards limiting the growth of weeds in crop land and so reduce the interference of these weeds on the crop growth and yield.

### Biological Weed Control

Biological weed control is a method whereby living organisms are used to control weeds; the growth of weeds is suppressed by the use of these living organisms. These organisms may be other plants (live mulch) with smothering canopies to suppress weed (Ayotamuno *et al.*, 2007). Light reception is prevented from penetration and reaching the ground by the canopy and the weed may eventually die. Grazing animals may also be used to control weeds particularly in plantation crop field. Insects and microorganisms have also been used to control weeds. Seaman (2009) <sup>[25]</sup> also supported the use of live mulch, organic or plastic mulches as a way of biological weed control.

### Cultural Manual or Cropping Method

These include proper crop rotations such that neither annual nor perennial weeds have a free growth continuous cropping with the same cropping system which leads to greater infestation of weeds. Hand weeding on 50 day after planting (DP) gave more yields due to minimum crop weed competition for resources in onion cultivation (Sarafet *et al.*, 2004). Zubiari *et al.*, (2009) reported that hand weeding was significantly better in increasing the bulb diameter, bulb weight and bulb yield when compared with un-weeded control (Singh and Singh 2007). Tewari *et al.*, (2019) observed higher onion bulb yield and weed control efficiency in treatment combination of one hand weeding on 35 DAP and mulching. According to Melander and Hartvig

(1997) <sup>[22]</sup>, hoeing close to the row leaving 8cm untilled strip has the potential of saving labour cost for hand weeding in non-herbicide growing system of onion. The higher bulb and weed control efficiency were recorded in the weed free plants. Priyadarshini and Anburani (2004) <sup>[23]</sup> stated that dry biomass of weeds was significantly reduced by the application of herbicides and through hand weeding practices. Greater management control was achieved with manual weeding throughout the cropping season of the onion cultivation (VedPrakash *et al.*, 2000). Ansa and Wiro (2018) noted that inter-cropping not only gives the farmers huge income but also controls the weeds which otherwise compete with the tree seedlings in taungya farming system. This makes inter-cropping effective in weed management.

### Chemical Weed Control

Chemical weed control involves the use of herbicides which are chemicals that kill the weeds or inhibit their growth. This method of weed control has the advantage of being less laborious, soil disturbance and erosion problem is minimal. It is rated as the quickest method of weed control without injuring the crops. According to (Kolhe, 2001) <sup>[19]</sup>, pre-emergence application of oxy-fluorene at 0.5kg ha<sup>-1</sup> in onion recorded maximum yield. He stated that dry matter of weeds was significantly reduced due to application of herbicides either alone or in combination with hand weeding at 40 DAP compared to weedy check in onion. Stall and Gilreath (2002) <sup>[27]</sup> reported that herbicides are widely applied for weed destruction in onion and cabbage. The small scale farmers use herbicides to suppress and kill weeds in the cultivation of onions in Nigeria.

### Mechanical Weed Control

The most common ones are hand pulling machines, hand weeding, burning, ploughing and harrowing. Pulling the weeds by hand or with the help of sickle is the oldest and most efficient method. Weeds can be easily uprooted after a good soaking irrigation or rain. Mechanical weed control is costly, time consuming and stressful.

Dhananivetha *et al.*, (2015) stated that mechanical weed control not only uproot the weeds between crop rows but also keep the soil surface loose, ensuring better soil aeration and water intake capacity. Weed morphology and stage of growth affect the selection and efficiency of the weeding implements.

### Integrated Weed Control

Integrated weed control is weed control method which involves the use of two or more weed control measures to control the weed interference below economic threshold level in crop farm business. For instance, the use of traditional weeding and herbicides: Weed competition can also be lowered by adequate and early application of fertilizer to spread up canopy closure by inter-cropping and by planting in the early dry season when weed growth is less vigorous (Tongglun *et al.*, 2000). The application of animal waste also helps to control weeds. According to Bastinaan *et al.*, (2008) the use of integrated method of weed control in the effective management of weeds in crops production is advisable. The advantage of the use of more than one weed control method is great (Liebman and Davis, 2000) <sup>[21]</sup>. The method uses weed identification, monitoring, sanitation, using different cultural operations (practices), application of

fertilizer and animal waste and timely herbicides treatments. The use of integrated method of weeding control is more effective and more efficient than any other weed control method.

### Conclusion

Onion is an important vegetable crop cultivated in Nigeria. The crop provides wonderful benefits to man. The role of small scale farmers are enormous. Onion has very poor competitive ability with weeds due to its inherent characteristics such as shallow root system, narrow leaf and less area. Among the numerous causes of poor productivity of onion in Nigeria, weed infestation is a serious problem. The conventional method of weed control is effective especially when done at the critical period of weed control. Many methods are therefore used to control weeds in onion production in Nigeria. To enhance and boost the production of this all important vegetable crop (onion), government should encourage the small scale farmers by granting them loans, subsidizing the cost of the planting material as well as providing them with certified seed (planting material).

### Recommendations

1. Integrated weed control which proves to be more effective in the control of weeds in onions should be utilized.
2. Pre-emergence herbicides are also of great importance in the control of weeds in onions and so should be used
3. The study of weeds and their pattern of growth should be researched on to enable small scale farmers effectively control weeds.
4. The consumption of onions should be increased for healthy living.
5. Weeds should be removed during the critical period of weed control to reduce its effect on the crops growth, development and yield;
6. Government should encourage onion production by granting loan to the small scale farmers in Nigeria.
7. Government should train more weed scientists to scientifically control weeds.

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