PDF - RESPONSE OF GROUNDNUT (ARACHIS HYPOGAEA L.) TO RHIZOBIA INOCULATION, NITROGEN AND PHOSPHORUS FERTILIZERS ON AN ALFISOL IN THE NORTHERN GUINEA SAVANNA OF NIGERIA - researchcub.infoCHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Groundnuts (Arachis hypogaea L) also known as peanuts, is aleguminous crop, a member of the genus Arachis in the family Leguminosae. It iswidely grown in the tropics and subtropics due to its nutritional and economicimportance. Groundnut is the most widely grown major legume worldwidecultivated in 118 countries and occupies more than 22.6 million ha that produceabout 36.4 million MT, with average yield of about 1600 kg ha-1(Abate et al.,2012).

Groundnut seeds (kernels) contain 40 -50 % fat, 20 – 50 %protein and 10 – 20 % carbohydrates (ICRISAT, 2003). Groundnut seeds arenutritional source of vitamin E, niacin, calcium, phosphorus, magnesium, zinc,iron, ribloflavin, thiamine and potassium (Kumar and Shankar, 2013). In most ofthe developing countries it provides high-quality cooking oil and is animportant source of protein for both human and animal diet and also providesmuch needed foreign exchange by exporting the kernels and cake. The uses ofgroundnut plant therefore, make it an excellent cash crop for domestic marketsas well as for foreign trade in several developing and developed countries(FAO, 2002).

In Africa, groundnut is grown mainly in Nigeria, Sudan,Senegal, Chad, Ghana, Congo, and Niger. Average productivity is 1720 kg ha-1 inNigeria which is poor when compared to the USA and other developed countrieswhere it is close to 3500 kg ha -1 (Vara-Prasad et al., 2009). The crop isgrown mostly by smallholder farmers under rainfed conditions with limitedinputs (Samson, 2012). Majority of the soils of the Guinea savanna of Nigeriaare inherently low in fertility especially organic matter, phosphorus andnitrogen (Odunze and Kureh, 2009; Oluwasemire and Alabi, 2004). To address thischallenge, farmers in the northern Guinea savanna usestrategies such asapplication of organic and inorganic fertilizers (Samson, 2012). The use ofinorganic fertilizers is effective but costly (Obisesan et al., 2013); thistherefore, leads to application at sub- optimal level that is, below therecommended rate (Olawale et al., 2009). On the other hand, organicfertilizers, such as crop residues and animal manures are bulky. They containrelatively low concentration of nutrients and handling them is laborious.ICRISAT (1995) recommended an application of 10 -12 t ha-1of chicken manure or20 t ha-1 of well decomposed farm yard- manure for groundnut production. Wambaet al. (2012) gave the nutrient content of poultry manure as 21.76 N g kg-1,8.74 P g kg-1 and 11.22 K g kg-1. This however depends on the handlingconditions. Much of the N in manure may be lost to the air if they are allowedto dry out or stored for a long time. Unlike cereals, legumes are able tosupplement their nitrogen (N) demand and contribute to soil N through variousprocesses. Legumes fix atmospheric nitrogen (N2) in the soil through itssymbiotic relationship with N- fixing bacteria. Legumes also add nitrogen tothe soil through falling leaf litter and, to a lesser extent by decaying rootsand root nodules below- ground, and thus they have great potential forrestoring degraded soils. The organic matter produced by legumes is generallyrich in nitrogen and of good quality, meaning that it decomposes quickly and isa good source of nitrogen for other plants (Giller, 2010). The ability oflegumes to fix N2 allows farmers to grow them with minimal inputs of Nfertilizer (Lupwayi et al., 2011). Therefore, farmers usually intercropnon-legumes with leguminous crops including groundnut having considered legumesto stabilize crop yields and also serves as a source of income and protein fortheir families. In the northern savanna of Nigeria, the bulk

of groundnut isproduced by small scale farmers using traditional system of mixed
cropping with maize, millet and sorghum. (Samson, 2012).
Nitrogen is considered as the most limiting plant nutrientfor crop production in West Africa (Sangakkara et al., 2003). Despite itsabundance in the atmosphere, plants are unable to use it directly because itis present in an inert form (N2) and the nitrogen in the soil is lost throughmicrobial dinitrification, soil erosion, leaching, chemical volatilization,removal of nitrogen containing crop residues from the field. As earliermentioned, groundnuts like other legumes play a primary role of fixingatmospheric N through their symbiotic relationship with Rhizobium spp., usuallyassociated with the host’s root system. This contributes nitrogenous compoundsto the soil, either directly, by nodule excretion, or indirectly, bydecomposition of root nodules and tissues (Giller, 2003). Biological NitrogenFixation (BNF) is an inexpensive, renewable resource option for smallholderfarmers, permitting them to redirect limited farm investment toward otherpressing household needs. One of the ways to increase biological nitrogenfixation is by inoculating legume seeds with rhizobium inoculants. Research hasalso shown that legumes grow best if there is some mineral N available asnodules form and a small amount of starter nitrogen (10 to 30 kg ha-1) atplanting may increase total BNF over the crops lifetime (Woomer, 2010). Thisstarter dose of nitrogen is necessary due to the lag period between rhizobiumcolonization and the onset
of nodule functioning. The starter dose however, increasesyield only on soils that are extremely deficient in nitrogen and where cropyield potential is high (Kucey, 1989;Woomer, 2010).

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Regards!!!