Composite flours have been reported to have been used for the production of acceptable cookies. Literature also supported the use of legumes as protein fortifiers of wheat based cookies. There however is a dearth of information on the use of maize, pigeon pea and wheat flours to produce multigrain cookies**.** The high cost of wheat flour and its low protein content has brought about the need to fortify wheat with low cost legumes which would result in products of high nutritional value. This study aims at formulating, producing and characterizing (physical and sensory) cookies produced from refined wheat, maize and dehulled pigeon pea flours in composite.

Degermed maize and dehulled pigeon pea flours were produced by modified methods. The flours were blended with wheat flour using the box – behnken design. Sixteen runs of blends were then used for the production of cookies after the bulk density, water absorption capacity, oil absorption capacity and swelling capacity were determined using standard methods. The cookies were produced from doughs baked at 1800C for 15 minutes and proximate composition determined by standard methods.Tannin and Oxalate contents of the cookies were also determined.

Sample 25W: 75M: 10P had the highest water absorption capacity while the corresponding cookie had the highest spread factor. Sample 25W: 25M: 10P having the least oil absorption capacity and sample 50W: 25M: 5P with the highest bulk density and highest thickness of 2.20cm. Sample 50W: 75M: 15P had the highest width of 4.43cm.

The swelling power ranged between 1.06 % in Sample 50W: 25M: 15P and 2.86 % in Sample 25W: 75M: 10P flour blends. Moisture content ranged from 2.19% to 5.63% with the cookie made from 50W: 75M: 5P flour blend having the least moisture content of 2.19%. Sample 25W: 50M: 15P and 75W:75M: 10P had the highest crude fiber content. Ash content of the cookies ranged from 1.10% to 2.13% with the cookie from Sample 75W: 75M: 10P blend having the highest ash content. The protein content of the cookie samples ranged from 10.01% to 17.86%. Sample 25W: 25M: 10P produced the lowest fat content. The result for tannin ranged from 0.0024mg/g to 0.0033mg/g and 1.31 mg/g to 2.83 mg/g for Oxalate. Sensory evaluation of the cookies showed that sample 75W: 25M: 10P was the most preferred in terms of the overall general acceptability. Response surface methodology showed that protein, Spread factor and oxalate were optimum at 5W: 20M: 10P.

The use of RSM has revealed the optimum values to be used for the production of a high protein-energy cookie and its combination with sensory evaluation result revealed that the combination of 75W: 25M: 10P produced an acceptable cookie high in protein and low in oxalate with a very good spread.