

DETERMINATION OF THE PASTING AND FUNCTIONAL PROPERTIES OF COWPEA

(*VIGNA UNGUICULATA*) AND SOYBEAN (*GLYCINE MAX*) BLENDS 45

6

7 ABSTRACT

8 **Aim:** This study was carried out to check the pasting and functional properties of
9 cowpea and soybean
10 blends for culinary uses.

11 **Methods:** The two legumes (cowpea and soybean) were combined in different
12 percentage of 90% to 10%
13 which serves as sample A and Sample B and C had 80% to 20% and 70% to 30%
14 respectively.

15 **Results:** The pasting properties results showed a reduction in trough value which
16 range from 0.50 RVU in
17 sample C to 8.00 RVU in sample A. Also a reduction in final viscosity results was
18 observed which ranged
19 between 9.50 RVU in sample C to 16.00 Rvu in sample A. The reduction followed
20 with increase in the
21 percentage of soybean blend with cowpea. The functional properties results showed
22 a decrease in bulk
23 density with an increase in soybean blend with cowpea (i.e sample A > B>C). The
24 same pattern of results
25 were recorded for water absorption and swelling capacity. Sample A have the
26 highest value in all the
27 functional properties determined except in oil absorption capacity, total soluble solid,
28 and wettability.

29 Increase in percentages of soybean substitution resulted to increase in oil absorption
30 capacity, total soluble
31 solid and wettability.

32 **Conclusion:** In conclusion, the pasting properties of the blend improved significantly
33 over that of
34 soybean alone, thus suggesting the trial of the blends for culinary uses such as the
35 production of *akara*,
36 and *moi-moi*.

37

38 **Keywords:** Pasting, Functional properties, Cowpea, Soybean, Culinary

39 INTRODUCTION

40 Pasting characteristic is the transition from a suspension of starch granules to paste
41 when heat is applied,

42 it is accomplished by a large increase in viscosity. It is a phenomenon that follows
43 gelatinisation in the

44 dissolution of starch. This involves granular swelling, exudation of molecular
45 **composnent** from the

46 granular and eventually total distruption of the granules [1]. Jideani [2] reported
47 functional properties as

48 intrinsic physico-chemical characteristics which affect the behaviour of a food
49 ingredient in food systems

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32 during processing manufacturing, storage and preparation. Henshaw et al.[3]
expressed functional
33 properties as physico-chemical properties that give information on how food
ingredients will behave in a
34 food system. Functional properties are therefore important in determining the quality
(nutritional, sensory,
35 physico-chemical and organoleptic properties) of the final product as well as
facilitating processing such
36 as improved machinability of cookie dough or slicing of processed meats. Functional
properties of food
37 protein are important in food processing and food product formulation [2]. Legumes
are generally
38 believed to be the cheapest source of plant protein available in West Africa.
Cowpea (*vigna unguiculata*)
39 is a primary food legumes with more than 90% of the world crop being produced in
west Africa region of
40 the world [4]. Cowpeas (*vigna unguiculata*) are probably the most popular grain
legume in West Africa
41 unlike other legumes such as soybean and groundnut, which are oil-protein seeds,
cowpeas are starch
42
protein seeds offering a wide pattern of utilization than any other legume in West
Africa [3]. Protein and
43 starch are the major macromolecules that contribute toward the functionality of
cowpea flour. The
44 suitability of cowpea flour for use in food products is attributed to its functionality in
terms of hydration,
45 foaming, gelation and pasting properties [5, 1]. The paste forms the basis of several
popular food items
46 such as moi-moi and akara which are prepared by steaming or deep-fat frying or
baking in some special
47 case or instances [6]. Soybean (*Glycine Max*) is a particularly great source of plant
protein in the world.
48 Its protein have high biological value while it cost is relatively low. Ajayi et al. [7]
reported that several
49 years of rigorous scientific and clinical research has established that most of the
component of soybean

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have beneficial health effect as characterised by its preventive potential for the so-
called life-style
51
related diseases. Furthermore, soybean proteins contain all amino acids essential to
human nutrition which
52 makes soy products almost equivalent to animal sources in protein quality but with
less saturated fat and

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53 no cholesterol. Soybean is not only high quality protein, but it is now thought to play preventive and

54 therapeutic roles for several diseases. In recent years, soybean, although high in protein and other nutrient

55 has defiled its use in making food products such as moinmoin and akara. Although its has been useful in

56 making other food such as soycheese (Tofu), flours and soy milk. Soybean contains about 35%

57 carbohydrates most of which is non-starch polysaccharides [7]. This may explain it poor pasting quality.

58 It will be of great importance if protein present in soybean can be complimented with starch through the

59 best local means i.e if soybean can be blended with cowpea for culinary uses.

Blending cowpea with

60 soybean will boost the starch component and increase the utilization of soybean for culinary purposes,

61 hence the need to study the pasting and functional behaviour of different blends of cowpea and soybean.

62

63 **Materials and Methods**

64 Cowpea and Soybean were purchased at Owode market in Offa, Kwara State, Nigeria. Processing

65 equipment and other materials were provided at the food processing laboratory of the department of food

66 technology, Federal Polytechnic Offa, Kwara State, Nigeria. The pasting properties of samples were

67 dertermined at the department of food science and technology, Federal University of Agriculture,

68 Abeokuta, Nigeria.

69 **Preparation of Samples**

70 The cowpea and soybean samples were sorted to remove damaged onces and other extraneous materials.

71 They were combined in the following ratios (90:10, 80:20 and 70:30) of cowpea and soybean

72 respectively. Exactly 200g of mixture were weighed for each sample. The samples were label A, B, and C

73 respectively.

74

75 **Preparation of Paste**

76 Each sample was soaked separately in a litre of cold water for one hour in other to soften the seed coats.

77 Thereafter, the seed coats were removed manually and the seeds rinsed in water until they were clean and

78 free from impurities. The samples were blended separately with 200ml of water using a Kenwood blender

79 until a fine paste was obtained. Each paste was transfer into a clean bowl and labelled accordingly.

80 **Determination of Functional properties of samples**

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Comment [SPCA10]: why these ratios?

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81 The functional properties of samples were determined based on standard methods
in the Association of
82 Official Analytical Chemist [8].
83 **Determination of the Pasting properties of samples**
84 The pasting properties of each sample was determined using a Rapid viscosity
Analyser (RVA).
85

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Data analysis?

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87 Results and Discussion

93 Table 1 showed the results of fuctional properties of the samples. The bulk density
of all the samples were
94 similar except little difference in value without significant differences at $p < 0.05$. The
bulk density is
95 influenced by particle size and density of the flour and is important in determining
the packaging
96 requirment and material hardling [9]. Low bulk density is reported to be influenced
by loose structure of
97 the starch polymer [10]. The result obtained for water absorption capacity ranged
between 1.56-1.72%.
98 Sample A which contained 90% cowpea flour and 10% soy flour gave the highest
water absorption
99 capacity followed by sample B and C respectively. This may be due to the
percentage soy flour added to
100 each sample. Osundahunse et al. [11] reported that good water absorption
capacity is desirable in food
101 system to improve yield and consistency and give body to the food. The low water
absorption capacity of
102 the cowpea-soyflour may be due to loose association of amylose and amylopectin
in the samples. This
103 result is supported by Lorenz and Ceollin, [12] and Malomo et al. [10]. They both
reported that water
104 absorpton capacity will be low if there is loose association between amylose and
amylopectin in the
105 native granules of starch and weak associative forces maintaing the granules
structure.
106 The Oil absorption capacity of all the samples were also different with significant
difference at $P < 0.05$.
107 Oil absorption capacity is an important property of cowpea flour that could be used
as an extender in
108 various culinary uses. The presence of soy flour in the sample reduced the rate of
oil absorption of all the

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other authors or papers? How do you know if
the bulk density is low or high?

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samples. This was shown in the reduction rate of the value obtained.

109 Low oil absorption is highly

110 desirable as far as flour product is concerned. [13].

111 Total soluble solid of all the samples showed no significant difference at $P < 0.05$.

sample A recorded the

112 lowest value with the remain samples (i.e sample A and B) having the same value (5%). The total soluble

113 solid is an indication of the rate at which such sample will dissolve in water. The result obtained were

114 good for cowpea – soybean flour analysed.

115 Wetability is the time taken for samples to absorb water. The wetability results revealed the effect of soy

116 flour on the samples. The wetability of the samples increased with increase in ratio of soy flour. Sample C

117 (90% cowpea, & 30% soy flour) had the highest value of 40.50%, followed by

sample B (11.00%) and

118 sample A (5.50%). It may be explained that soy flour showed the highest level of water absorption which

119 resulted in the increase of wetability of sample with the highest ratio of soy flour.

120 The swelling capacity of the three samples followed the same trend of water absorption capacity with

121 sample C having the lowest swelling capacity (3.10%), followed by sample B (3.25%) and highest in

122 sample A (3.57%). The swelling capacity results of the three samples may be due to the ratio of soy flour

123 to cowpea flour in all the samples. The swelling index or swelling capacity is largely controlled by the

124 strength and character of the micellar network within the starch granules [14]. The starch granules present

125 in the samples showed a weak strength which resulted in low swelling capacity.

This result is in line with

126 the result of Abioye et al. [15], who reported a decrease in swelling capacity of soy – plantain flour.

127 The result of the pasting characteristics results are shown in Table 2. The pasting characteristics indicate that

128 the addition of soy flour reduced the peak viscosity of all the samples. Sample A, which contained the

129 smallest amount of soy flour had the highest peak viscosity value of 17.00 RVU followed by sample B

130 and C with the same value (10.50 RVU). The equal value of sample B and C indicates that there is a

131 particular ratio of substitute that will affect the final peak viscosity. This result is in consonant with the

132 result of Abioye et al. [15]. The trough viscosity, which is the minimum viscosity value, measures the

133 ability of paste to withstand breakdown during cooling and it ranged from 0.50 to 8.00 RVU. This also

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134 followed the same trend with that of peak viscosity. The final viscosity is the most commonly used

135 parameter to determine a particular starch based sample quality. It gives an idea of the ability of such

136 material to gel after cooking [16]. The final viscosity decreased with increase in soy flour substitution.

137 This is an indication that the ability of the material (i.e food substance) to form a viscous paste or gel after

138 cooking and cooling, as well as the resistance of such paste to shear stress during stirring is low.

139 The value obtained range from 16.00 RVU for sample A, 9.50 RVU for sample B and C. This result is

140 also supported by Abioye et al. [16], who reported a decrease in final viscosity of soy – plantain flour.

141

142 CONCLUSION

143 This study showed that the addition of soybean to cowpea had a significant influence on the pasting and

144 functional properties of the different samples. When compared with the pasting and functional properties

145 of cowpea the differences observed are not significant enough to discourage the use of the blend samples

146 for culinary purposes such as the production of akara, moi-moi etc. Furthermore, when compared with

147 the pasting properties of soybean there is a significant improvement. This suggests that the blend can be

148 used for culinary uses.

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Page 5: [1] Comment [SPCA30]	Sandra Patricia Chaparro Acuña	6/5/2014 9:14:00 AM
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It is important to do a proximate analysis of every seed and the mixture of them to know if the starch or protein can affect the functional properties.

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