Pengembangan Cookies Non Gluten Berbahan Tepung Sorghum Dan Tepung Labu Kuning

by Yusep Ikrawan -

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JUDUL PENELITIAN :

PENGEMBANGAN *COOKIES NON GLUTEN* BERBAHAN TEPUNG SORGHUM DAN TEPUNG LABU KUNING

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ABSTRAK

Perbandingan labu dan tepung sorgum pada karakteristik cookie bebas gluten telah dilakukan. Desain perlakuan terdiri dari perbandingan tepung labu dengan sorgum p1 (3: 1), p2 (2: 1), p3 (1: 1), p4 (1: 2), p5 (1: 3), dan p0 sebagai kontrol. Hasil dari studi pendahuluan menunjukkan bahwa waktu pencampuran selama 8 jam memperoleh rasio penyebaran 56,85% dan hasil 92,14%. Hasil utama penelitian menunjukkan bahwa perbandingan tepung labu dengan tepung sorgum berpengaruh pada respon kimia (kadar air, kadar abu) dan respon organoleptik (warna, aroma, rasa, dan tekstur). Berdasarkan hasil analisis kimia dan organoleptik, perlakuannya adalah p5 (perbandingan tepung labu dengan tepung sorgum 1: 3) memiliki kandungan tanin 0,26%, kadar serat kasar 11%, dan kandungan beta-karoten 0,44 ppm.

Kata Kunci : *Cookies Gluten Free*, Tepung Labu Kuning, Tepung Sorgum

ABSTRACT

Pumpkin and sorghum flour ratio on the characteristics of gluten-free cookies was carried out. The treatment design consisted of a comparison of pumpkin flour with sorghum p1 (3: 1), p2 (2: 1), p3 (1: 1), p4 (1: 2), p5 (1: 3), and p0 as control. The results of the preliminary study showed that the mixing time for 8 hours obtained a spread ratio of 56.85% and a yield of 92.14%. The main results of the study showed that the ratio of pumpkin flour with sorghum flour had an effect on the chemical response (water content, ash content) and organoleptic response (color, aroma, taste, and texture). Based on the results of chemical analysis and organoleptic, the treatment was p5 (the ratio of pumpkin flour with 1: 3 sorghum flour) had tannin content of 0.26%, crude fiber content of 11%, and beta-carotene content of 0.44 ppm.

Key Words : *Cookies Gluten Free*, pumpkin flour, Sorghum flour

BAB 1 PENDAHULUAN

Cookies merupakan alternatif makanan selingan yang cukup dikenal dan digemari oleh masyarakat. *Cookies* dikategorikan sebagai makanan ringan karena dapat dikonsumsi setiap waktu (Departemen Perindustrian RI, 1990). *Cookies* merupakan salah satu jenis biskuit yang dibuat dari adonan lunak, renyah dan bila dipatahkan penampangnya tampak bertekstur kurang padat (BSN, 2011).

Bahan utama yang digunakan untuk pembuatan *cookies* adalah tepung terigu (Mariyani, 2012). Tepung terigu memiliki kandungan protein unik (gluten) yang membentuk suatu massa lengket dan elastis ketika dibasahi air. Glutenin memberikan sifat – sifat yang tegar dan gliadin memberikan sifat yang lengket sehingga mampu memerangkap gas yang terbentuk selama proses pengembangan adonan dan membentuk struktur remah produk (Faridah dkk., 2008).

Gluten dalam suatu produk olahan masih menjadi permasalahan terutama untuk anak penderita autis. Anak penderita autis tidak bisa mencerna gluten dengan sempurna. Kombinasi asam amino yang ada di dalam gluten tidak dapat dipecah menjadi asam amino tunggal oleh sistem pencernaan anak dengan gangguan autis, tetapi masih dalam bentuk peptida. Peptida yang tidak tercerna tersebut dapat diserap oleh usus halus yang selanjutnya masuk ke dalam peredaran darah dan diteruskan ke reseptor opioid otak. Peningkatan aktivitas opioid akan menyebabkan gangguan susunan saraf pusat dan dapat menyebabkan efek kuat pada perilaku, sama halnya dengan heroin atau morfin. Zat ini menyebabkan berbagai masalah, seperti mengantuk, tidak memiliki perhatian atau bengong, dan memiliki perilaku yang agresif (Sari, 2009).

Berkaitan dengan hal itu perlu ada bahan baku lain yang dapat menggantikan terigu. Beberapa bahan yang dapat digunakan adalah tepung sorgum dan tepung kuning.

Labu kuning memiliki kandungan gizi yang cukup lengkap seperti karbohidrat, protein, dan vitamin serta betakaroten (Sudarto, 1993); (Kamsiati, 2010). Karoten mempunyai sifat fungsional sebagai antioksidan yang melindungi sel dan jaringan dari kerusakan akibat adanya radikal bebas dalam tubuh. Karoten juga berhubungan dengan peningkatan fungsi sistem kekebalan tubuh, melindungi dari kerusakan akibat paparan sinar matahari dan menghambat kanker (Russel, 2006).

Sorgum merupakan bahan pangan alternatif penting sebagai bahan pangan karena sorgum memiliki nilai gizi yang tinggi dengan kandungan pati sebesar 72%, protein 12%, dan lipid 4% (Susilowati, 2009).

Menurut Suarni (2002), Siller (2006), dan Schoberetal (2007), menunjukkan bahwa sorgum sebagai pangan fungsional karena kandungan beberapa komponen kimia penyusunnya. Sorgum dalam bentuk tepung lebih menguntungkan karena lebih praktis dan lebih mudah diolah menjadi berbagai produk makanan ringan. Salah satu industri makanan telah memanfaatkan tepung sorgum untuk membuat *crackers* dan hasilnya terbukti lebih renyah dibandingkan yang dibuat dari tepung terigu/gandum. Untuk pembuatan kue basah, roti, mie pemanfaatan sorgum dapat mensubstitusi penggunaan terigu masing – masing sebanyak 30% -50%, 20% - 25%, dan 15% - 20% tanpa mengurangi rasa, tekstur, dan aroma secara signifikan.

Berdasarkan pernyataan-pernyataan diatas, maka perlu dilakukan penelitian yang kaitannya dengan pengganti tepung terigu dalam pembuatan *cookies gluten free* dengan tepung labu kuning dan tepung sorgum tidak mengandung gluten dan memiliki banyak zat gizi.

BAB 2 TINJAUAN PUSTAKA

Cookies merupakan salah satu jenis biskuit, menurut SNI 2973. *Cookies* merupakan salah satu jenis biskuit yang dibuat dari adonan lunak, renyah dan bila dipatahkan penampangnya tampak bertekstur kurang padat (BSN, 2011). Bahan utama dalam pembuatan cookies adalah terigu. Akan tetapi bahan baku alternative lain yang dapatdigunakan dalam pembuatan cookies adalah tepung labu kuning dan tepung sorgum.

Tepung labu kuning mempunyai sifat spesifik dengan aroma khas. Secara umum, tepung tersebut berpotensi sebagai pendamping terigu dan tepung beras dalam berbagai produk olahan pangan. Produk olahan dari tepung labu kuning mempunyai warna dan rasa yang spesifik, sehingga lebih disukai oleh konsumen. Teknologi pembuatan tepung merupakan salah satu proses alternatif produk setengah jadi yang dianjurkan karena lebih tahan disimpan, mudah dicampur (dibuat komposit), dibentuk, diperkaya zat gizi, dan lebih cepat dimasak sesuai tuntutan kehidupan modern yang serba praktis (Hendrasty, 2003).

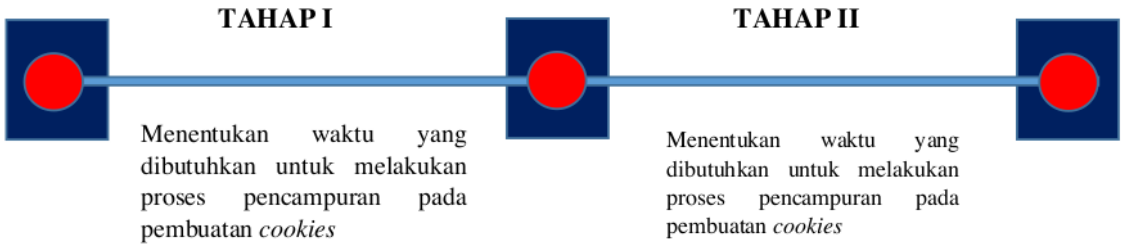
Sorgum merupakan bahan pangan alternatif yang menempati urutan kelima setelah beras, jagung, dan gandum. Sorgum memiliki nilai gizi yang tinggi dengan kandungan pati sebesar 72%, protein 12%, dan lipid 4% (Susilowati, 2009). Masalah utama penggunaan biji sorgum sebagai bahan pangan maupun pakan adalah kandungan tanin yang cukup tinggi, yakni mencapai 2,7-10,2%. Kandungan tanin yang tinggi, selain mempengaruhi rasa, juga bersifat anti gizi. Oleh karena itu untuk meningkatkan cita rasa dan nilai gizi sorgum, perlu diupayakan menurunkan kandungan tanin serendah mungkin. Berdasarkan warna perikarp dikenal 4 jenis sorgum dengan kandungan tanin yang berbeda yaitu sorgum berwarna putih dengan kandungan tanin 0,25-0,46%, sorgum kuning (tanin 0,25-0,3%), sorgum berwarna krem (tanin 0,26-0,67%) dan sorgum merah (tanin 0,45-2,92%) (Osuntogun, 1989). Beberapa pemanfaatan tepung sorgum dalam olahan pangan dengan substitusi tepung terigu di antaranya untuk *cookies* 50-75%, *cake* 30-50%, roti 20-25%, mie 15-20% (Suarni 2004), dan pembuatan wafel 30% tepung sorgum disubstitusi dengan 70% tepung terigu dihasilkan seperti *wafel* 100% terigu (Dewi, 2000).

Widyastuti (2015) menyatakan bahwa substitusi tepung labu kuning pada pembuatan biskuit labu kuning memberikan pengaruh terhadap daya terima yang meliputi warna, aroma, rasa, dan kesukaan keseluruhan serta tidak terdapat pengaruh substitusi tepung labu kuning pada pembuatan biskuit labu kuning terhadap daya terima dari segi tekstur. Pada atribut warna, warna biskuit yang

paling disukai adalah biskuit dengan substitusi labu kuning sebesar 10%. Semakin tinggi substitusi tepung labu kuning pada biskuit labu kuning maka kadar betakaroten semakin tinggi.

Menurut See *et.al*., (2007), penambahan tepung labu kuning sebesar 5% menghasilkan roti dengan volume yang tinggi dan dapat diterima oleh panelis. Pada evaluasi sensori juga menunjukkan bahwa roti dengan penambahan tepung labu kuning sebesar 5% adalah roti yang paling dapat diterima.

Peta Jalan Penelitian



BAB 3 TUJUAN DAN MANFAAT PENELITIAN

3.1. Tujuan

Tujuan dari penelitian ini adalah untuk menentukan perbandingan tepung labu kuning dengan tepung sorgum dalam pembuatan *cookies gluten free*.

3.2. Manfaat

Manfaat dari penelitian ini adalah untuk memberikan informasi dan referensi mengenai pembuatan *cookies gluten free*, menambah alternatif penganekaragaman produk olahan pangan berbahan baku tepung labu kuning dan tepung sorgum, meningkatkan nilai ekonomis tepung labu kuning dan tepung sorgum, serta menghasilkan produk pangan yang dapat diterima dan dikonsumsi oleh masyarakat.

BAB 4 METODE PENELITIAN

3.1. Bahan

Bahan yang digunakan dalam penelitian adalah labu kuning (varietas labu kuning bokor / cerme, berumur 3 - 4 bulan, berwarna kuning kehijauan, kulit agak keras, dengan tangkai agak besar) yang diperoleh dari Pasar Gedebage, sorgum (varietas sorgum putih, berumur 3 – 4 bulan, berwarna putih, *parboiled*, dengan kulit telah disosoh) yang diperoleh dari Javara, *baking powder*, margarin, gula halus, kuning telur, dan maizena yang diperoleh dari PD Kijang Mas. Bahan yang digunakan untuk analisis kimia yaitu H_2SO_4 0,3 N, NaOH 0,3 N, NaCl, $KMnO_4$ 0,01 N, Kaolin, indigo, gelatin, dan aquadest.

3.2. Alat

Alat-alat yang digunakan dalam proses penelitian yaitu pisau, baskom, sendok, *slicer*, *chopper*, *tray*, *cabinet dyer*, *vibratory screen*, oven (*kirin*), *mixer* (*philips*), timbangan analitik (*meter toledo* PL 202-S), cetakan kue kering, loyang tempat adonan, sendok, spatula, *rolling press*, dan jangka sorong.

Alat-alat yang digunakan dalam analisis kimia yaitu labu takar 250 mL (*pyrex*), labu takar 100 mL (*pyrex*), buret (*pyrex*), erlenmeyer 250 mL (*pyrex*), gelas kimia 250 mL, lakmus merah, kertas saring, pipet tetes, pipet volumetri 10 mL pipet volumetri 5 mL (*iwaki*), kaca arloji, cawan porselen, penangas, batang pengaduk, corong, dan tangkrus.

3.3. Prosedur Penelitian

Penelitian Tahap I

1. Pembuatan Tepung Labu Kuning
2. Pembuatan Tepung Sorgum
3. Menentukan Waktu Pencampuran

Analisis :

1. Derajat Pengembangan

2. Rendemen

Penelitian Tahap II

Menentukan Perbandingan Tepung Labu Kuning dan Tepung Sorgum

Analisis :

1. Kadar Air
2. Kadar Abu
3. Kadar Serat
4. Kadar Tanin
5. Kadar Betakaroten

3.4. Rancangan Percobaan

Model rancangan percobaan yang digunakan pada penelitian adalah Rancangan Acak Kelompok (RAK) yang terdiri dari 1 faktor dengan 6 taraf sebanyak 4 kali ulangan, sehingga didapatkan 24 satuan percobaan.

Faktor Perbandingan (P) terdiri dari 6 taraf:

p_0 = 100% tepung terigu (Kontrol)

p_1 = 3 : 1

p_2 = 2 : 1

p_3 = 1 : 1

p_4 = 1 : 2

p_5 = 1 : 3

3.5.Rancangan Respon

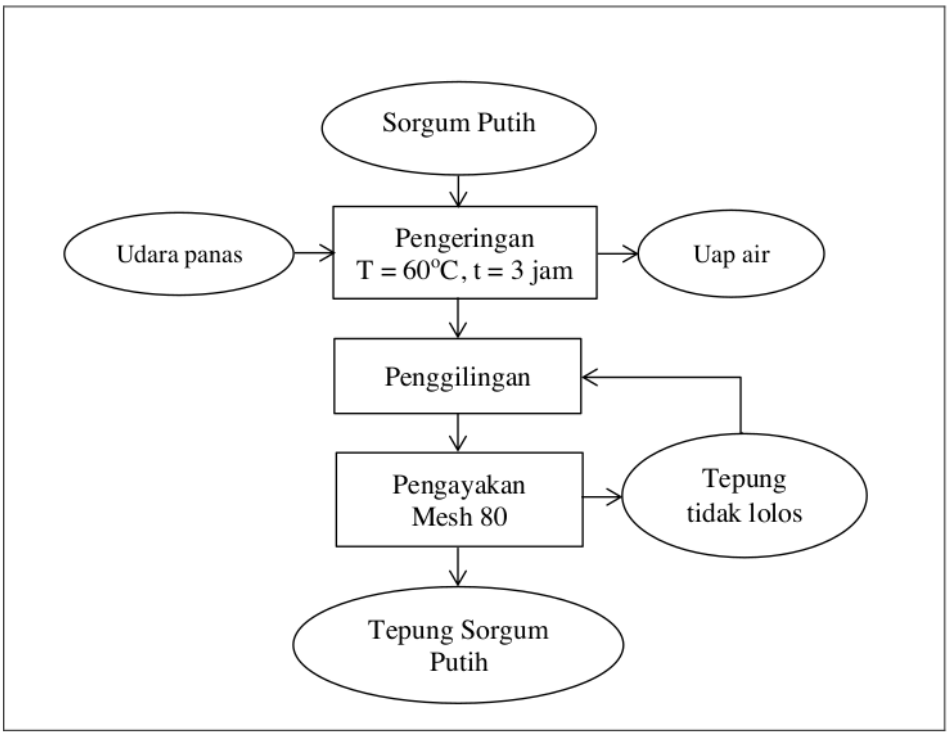
Respon Kimia (Kadar Air, Kadar Abu); Respon Fisik (Derajat Pengembangan, Rendemen); dan Respon Organoleptik.

3.6.Luaran Yang diharapkan

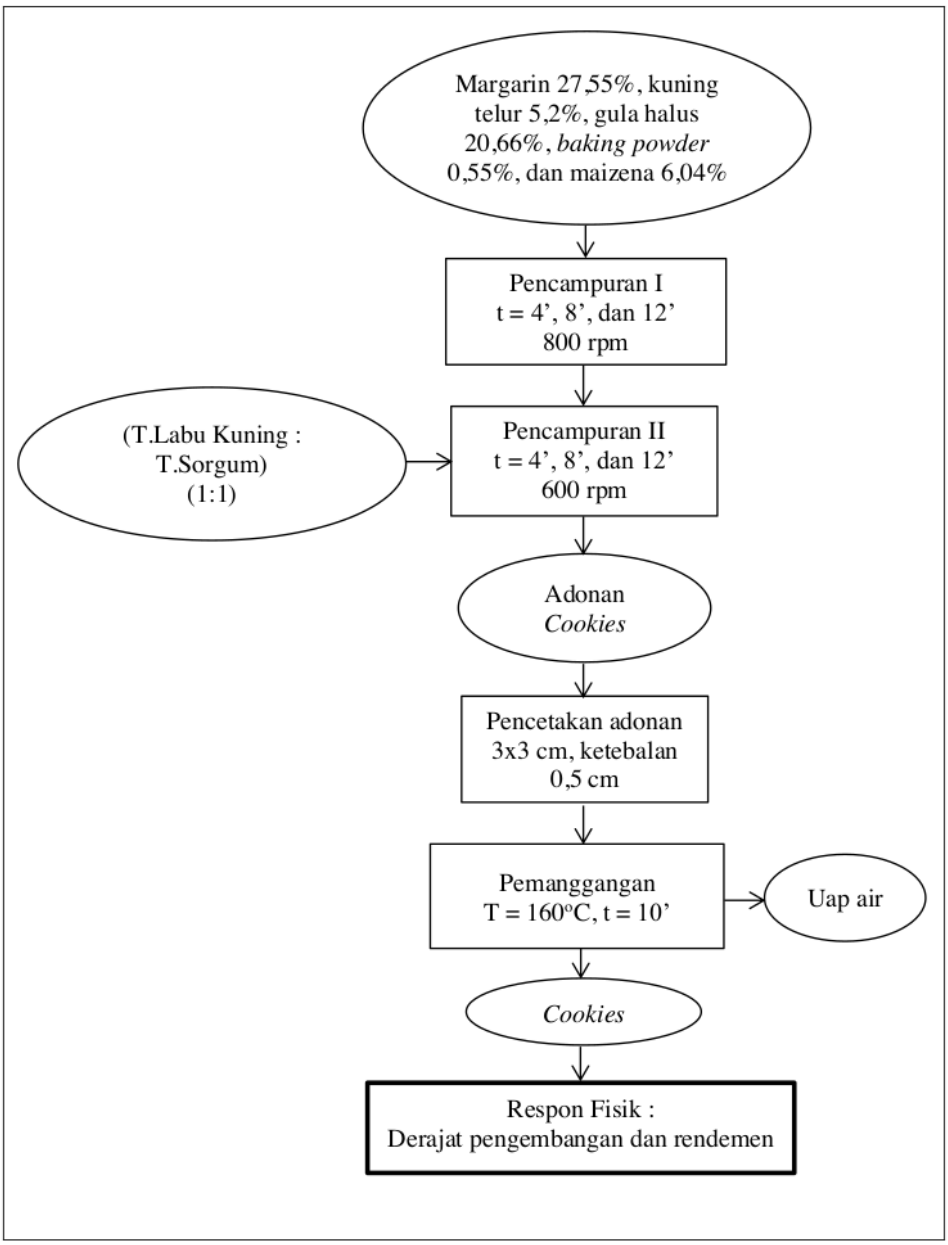
Hasil dari penelitian akan dihasilkan artikel untuk dipublikasikan dalam seminar nasional/jurnal Nasional/Pasundan Food Technology Journal

BAB 5 HASIL DAN PEMBAHASAN

5.1. Penelitian Tahap I



Gambar 1. Diagram Alir Pembuatan Tepung Sorgum



Gambar 2. Diagram Alir Penelitian Tahap I

5.1.1. Pembuatan Tepung Labu Kuning

Penelitian tahap I dilakukan untuk mengetahui kandungan bahan baku yang digunakan dalam pembuatan *cookies gluten free*. Hasil analisis kimia tepung labu kuning dapat dilihat pada Tabel 1.

Tabel 1. Hasil Analisis Kimia Tepung Labu Kuning

Pengujian	Kadar
Kadar Air	8,5 %
Kadar Betakaroten	2,23 ppm

Kadar Air

Berdasarkan hasil analisis kadar air menggunakan metode gravimetri, kadar air yang terkandung pada tepung labu kuning adalah sebesar 8,5 % yang menunjukkan bahwa tepung labu kuning memiliki kadar air yang rendah. Menurut hasil penelitian See *et.al.,* (2007) kadar air tepung labu kuning memiliki hasil yang lebih tinggi yaitu 10,96 % ± 0,12 %. Menurut hasil penelitian Pongjanta *et.al.,* (2006) tepung labu kuning memiliki kadar air sebesar 6,01 % ± 1,47 %, menurut El – Demery (2011) tepung labu kuning memiliki kadar air sebesar 10,64 %, dan menurut Bhat *et.al.,* (2013) tepung labu kuning memiliki kadar air sebesar 6,01 %.

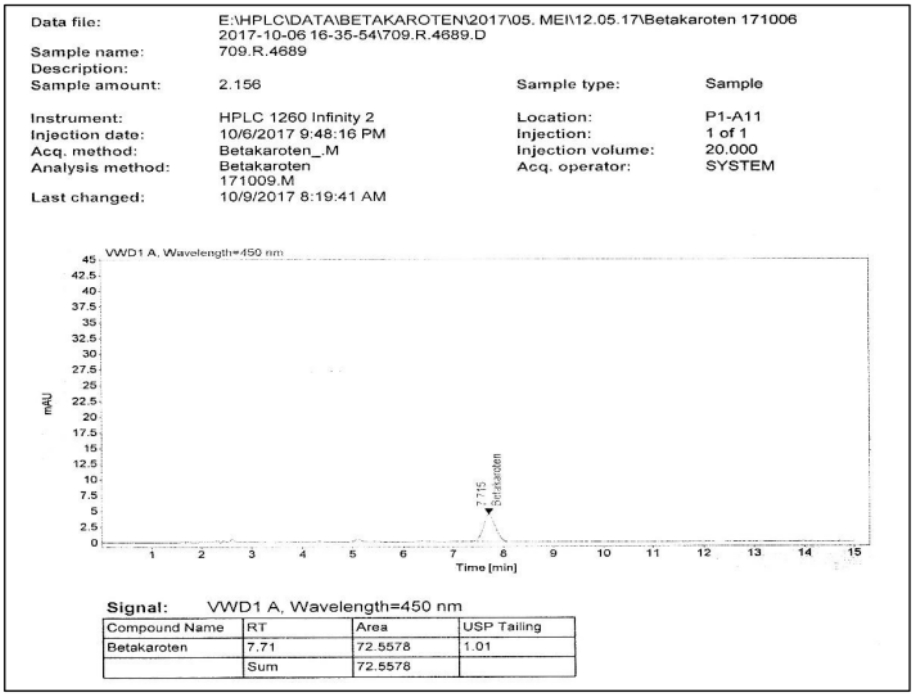
Perbedaan kadar air tersebut dapat terjadi karena adanya faktor internal dan faktor eksternal. Faktor internal yang mungkin terjadi adalah perbedaan umur labu kuning yang digunakan. Karena semakin tua labu kuning, maka akan semakin tinggi kadar air yang terkandung dalam buah tersebut. Faktor eksternal yang mempengaruhi di antaranya lama pengeringan, suhu pengeringan, serta jenis alat pengeringan yang digunakan sehingga kadar air yang dihasilkan tepung labu kuning lebih rendah dari hasil penelitian See *et.al.,* (2007). Menurut Bothast *et.al.,* (1981) tepung labu kuning dengan kadar air di atas 14% sangat rentan terhadap jamur dan pertumbuhan jamur.

Menurut Standar Nasional Indonesia (SNI No. 3751 : 2009) tentang tepung terigu, syarat mutu kadar air untuk tepung adalah maksimal 14,5%. Maka tepung labu kuning telah memenuhi Standar Nasional Indonesia karena tepung labu kuning yang dihasilkan memiliki kadar air sebesar 8,5%.

Kadar Betakaroten

Berdasarkan hasil analisis kadar betakaroten menggunakan metode HPLC dari bahan baku tepung labu kuning, didapatkan kadar betakaroten sebesar 2,23 ppm atau 0,223 mg/100 gram. Hasil kromatogram kadar betakaroten pada tepung labu kuning dapat dilihat pada Gambar 3.

Menurut hasil penelitian Bhat *et.al.,* (2013) tepung labu kuning memiliki kadar betakaroten sebesar 7,30 mg/100 gram, sedangkan pada penelitian yang dilakukan oleh Pongjanta *et.al.,* (2006) tepung labu kuning memiliki kadar betakaroten sebesar 7,29 ± 3,82 mg/100 gram. Hasil analisis kadar betakaroten yang dilakukan mempunyai kandungan yang lebih rendah dibandingkan dengan kedua literatur. Faktor – faktor yang dapat mempengaruhi kadar betakaroten dari tepung labu kuning yakni varietas, suhu pengeringan, serta tingkat kematangan.



Gambar 3. Kromatogram Betakaroten Tepung Labu Kuning

5.1.2. Pembuatan Tepung Sorgum

Penelitian tahap I juga dilakukan mengetahui metode pembuatan tepung sorgum, dan menganalisis kandungan bahan baku yang digunakan dalam pembuatan *cookies gluten free*. Hasil analisis kimia tepung sorgum dapat dilihat pada Tabel 2.

Tabel 2. Hasil Analisis Kimia Tepung Sorgum

Pengujian	Kadar
Kadar Air	6,5 %
Kadar Tanin	0,52 %

Kadar Air

Berdasarkan hasil analisis kadar air menggunakan metode gravimetri, kadar air yang terkandung pada tepung sorgum adalah sebesar 6,5 % yang menunjukkan bahwa tepung sorgum memiliki kandungan air yang rendah. Menurut penelitian Suarni dan Firmansyah (2005), tepung sorgum memiliki kadar air sebesar 11,02 %, sedangkan menurut Sari (2016) tepung sorgum memiliki kadar air sebesar 10,37 %. Hasil analisis kadar air yang dilakukan memiliki kandungan yang lebih rendah dibandingkan dengan kedua literatur. Faktor – faktor yang dapat mempengaruhi kadar air dari tepung sorgum yakni lama pengeringan dan suhu yang digunakan.

Rendahnya kadar air tepung sorgum karena adanya penguapan selama penepungan. Selain itu, sebagian besar air terserap di bagian kulit, sehingga mengubah tekstur kulit liat dan terpisah dari endosperm. Kadar air tepung sorgum mempengaruhi kemampuan daya serap air yang ditambahkan selama pembuatan adonan, selain itu dipengaruhi oleh besar kecilnya ukuran partikel dan kadar protein, serta jenis proteinnya (Suarni dan Patong, 2002).

Menurut Standar Nasional Indonesia (SNI No. 3751 : 2009) tentang tepung terigu, syarat mutu kadar air untuk tepung adalah maksimal 14,5%. Maka tepung sorgum telah memenuhi Standar Nasional Indonesia karena tepung sorgum yang dihasilkan memiliki kadar air sebesar 6,5%.

Kadar Tanin

Berdasarkan hasil analisis kadar tanin menggunakan metode titrasi permanganometri, kadar tanin yang terkandung pada tepung sorgum adalah sebesar 0,52 % yang menunjukkan bahwa tepung sorgum memiliki kandungan tanin yang rendah. Menurut Watson (1984) tepung sorgum memiliki kadar tanin sebesar 0,003 – 0,17 %. Hasil analisis kadar tanin yang dilakukan memiliki kandungan yang lebih tinggi dibandingkan dengan literatur. Faktor – faktor yang dapat

mempengaruhi kadar tanin dari tepung sorgum yakni varietas, penyosohan, serta proses penepungan.

Dengan penepungan, kandungan protein dan nutrisi lainnya mengalami penurunan. Kandungan tanin (anti nutrisi) pada biji sorgum turun di atas 60%. Tepung yang diperoleh dengan metode kering menghasilkan kadar tanin rendah. Dengan metode basah, kandungan tanin tidak terukur. Senyawa tanin (polifenol) merupakan anti nutrisi dalam bahan pangan sorgum, yang dapat menghambat penyerapan nutrisi, seperti protein dalam proses enzimatik. Senyawa tanin tidak diinginkan tersisa dalam bahan karena selain menurunkan mutu warna produk olahan juga menurunkan nilai gizi makanan (Winarno 2004).

5.1.3. Penentuan Waktu Pencampuran

Penelitian tahap I dilakukan untuk menentukan waktu proses pencampuran yang sesuai dalam menghasilkan produk *cookies gluten free*. Waktu pencampuran yang digunakan yaitu 4 menit, 8 menit, dan 12 menit. Untuk menentukan waktu pencampuran yang terpilih dilakukan analisis statistik metode skoring dengan menggunakan respon fisik yaitu derajat pengembangan dan rendemen.

Derajat Pengembangan

Derajat pengembangan diperoleh dengan membandingkan ketebalan dan lebar produk *cookies gluten free* dengan ketebalan dan lebar adonan awalnya dengan menggunakan jangka sorong. Hasil pengukuran derajat pengembangan dapat dilihat pada Tabel 3.

Tabel 3. Hasil Pengukuran Derajat Pengembangan *Cookies Gluten Free*

Waktu Pencampuran	Hasil Pengukuran (%)	Skor
4 menit	50,73	1
8 menit	56,85	3
12 menit	50,62	1

Berdasarkan pada Tabel 3. menunjukkan bahwa waktu pencampuran selama 8 menit memberikan derajat pengembangan paling tinggi yaitu sebesar 56,85% dibandingkan dengan hasil derajat pengembangan pada waktu pencampuran selama 4 menit dan 12 menit yaitu 50,73% dan 50,62%. Hal ini disebabkan waktu pencampuran 8 menit merupakan waktu optimum untuk *cookies gluten free* mengalami pengembangan, sedangkan waktu pencampuran yang berlebihan akan menyebabkan derajat pengembangan menurun.

Derajat pengembangan dipengaruhi oleh waktu pencampuran. Semakin lama waktu pencampuran, *cookies* yang dihasilkan akan mengalami penyusutan derajat pengembangan. Hal ini disebabkan karena terjadi penyusutan ukuran kristal gula sehingga *cookies* yang dihasilkan menjadi lebih kecil dan padat. *Cookies* yang memiliki ukuran kecil dan padat, akan memiliki derajat pengembangan yang rendah (Inayati, 1991 dalam Marissa, 2010).

Faktor lain yang mempengaruhi derajat pencampuran adalah kemampuan pengkriman lemak pada proses pencampuran. Kemampuan (mutu) pengkriman lemak merupakan hal yang penting karena saat pengkriman, lemak akan memerangkap dan menahan sel – sel udara (Lopulalan, 2008). Waktu pencampuran yang berlebih akan merusak susunan yang terbentuk sehingga pengembangan *cookies* akan menurun. Derajat pengembangan berpengaruh terhadap tekstur produk. Produk yang lebih mengembang akan memiliki tekstur yang lebih renyah.

Menurut Fustier *et.al.,* (2009), proporsi penambahan lemak dan gula dalam formula *cookies* cukup mempengaruhi ikatan pengembangan. *Cookies* yang dibuat dengan metode *wire – cut* dengan kandungan lemak dan gula yang tinggi memiliki viskositas yang rendah. Viskositas yang rendah tersebut menyebabkan *cookies* melebar dengan cepat. Pengembangan terjadi akibat larutnya gula - gula selama pemanggangan sehingga menyebabkan *cookies* melebar.

Rendemen

Rendemen merupakan persentase antara produk akhir yang dihasilkan dengan produk awal. Rendemen sangat penting diketahui untuk mendapat gambaran seberapa besar suatu produk dapat dimanfaatkan dengan baik dan nilai ekonomis produk tersebut. Semakin tinggi rendemen suatu produk dapat dikatakan produk tersebut memiliki nilai ekonomis yang tinggi pula (Lopulalan, 2008).

Pengujian rendemen dilakukan dengan membandingkan berat produk *cookies gluten free* yang dihasilkan dengan berat adonan awal. Hasil pengukuran rendemen dapat dilihat pada Tabel 4.

Tabel 4. Hasil Pengukuran Rendemen *Cookies Gluten Free*

Waktu Pencampuran	Hasil Pengukuran (%)	Skor
4 menit	96,577	1
8 menit	92,143	3
12 menit	96,717	1

Berdasarkan pada Tabel 4. menunjukkan bahwa waktu pencampuran selama 8 menit memberikan hasil rendemen yang lebih rendah yaitu sebesar 92,143% dibandingkan dengan hasil rendemen pada waktu pencampuran selama 4 menit dan 12 menit yaitu 96,577% dan 96,717%. Hal ini berhubungan dengan derajat pengembangan. *Cookies* yang memiliki derajat pengembangan rendah akan menghasilkan rendemen yang tinggi karena air tidak teruapkan secara sempurna ketika proses pemanggangan, sedangkan *cookies* yang memiliki derajat pengembangan tinggi akan menghasilkan rendemen yang rendah karena air teruapkan secara sempurna ketika proses pemanggangan.

Hasil ini sesuai dengan penelitian Marissa (2010), menunjukkan menurunnya berat produk bila dibandingkan dengan adonan awal disebabkan adanya penguapan air pada saat pemanggangan sehingga menyebabkan penurunan bobot *cookies*.

Penentuan Waktu Pencampuran Terpilih

Berdasarkan hasil pengukuran derajat pengembangan dan rendemen dengan analisis statistik metode skoring, pemilihan waktu pencampuran terpilih yaitu pada produk dengan waktu pencampuran 8 menit karena dilihat dari skor, produk dengan waktu pencampuran 8 menit memiliki total skor paling tinggi sehingga produk tersebut merupakan produk terpilih dalam penelitian pendahuluan. Hasil dari penelitian pendahuluan ini selanjutnya akan digunakan pada penelitian utama. Hasil analisis statistik metode skoring terhadap derajat pengembangan dan rendemen produk *cookies gluten free* dapat dilihat pada Tabel .5

Tabel 5. Hasil Analisis Statistik Metode Skoring Penentuan Waktu Pencampuran Terpilih pada Penelitian Tahap I

Waktu Pencampuran	**Respon Fisik**		**Total**
	Derajat Pengembangan	**Rendemen**	
4 menit	(50,73 %) 1	(96,58%) 1	2
8 menit	**(56,85 %) 3**	**(92,14%) 3**	**6**
12 menit	(50,62 %) 1	(96,72%) 1	2

Menurut Inayati (1991) dalam Marissa (2010), proses pencampuran antara krim, margarin, gula halus, dan garam dilakukan selama 10 menit. Pengocokan yang berlebihan akan membuat adonan menjadi panas sehingga merusak tekstur biskuit serta menyebabkan retak pada permukaan biskuit pada saat pemanggangan. Pengocokan margarin dan gula yang terlalu lama pun dapat menyebabkan penyusutan ukuran kristal gula sehingga *cookies* yang dihasilkan menjadi lebih kecil dan padat.

BAB 6. KESIMPULAN DAN SARAN

6.1. Kesimpulan

Waktu pencampuran terpilih adalah selama 8 menit. Tepung labu kuning memiliki kadar air sebesar 8,5%, dan kadar betakaroten sebesar 2,23 ppm. Tepung sorgum memiliki kadar air sebesar 6,5% dan kadar tanin sebesar 0,52%.

6.2. Saran

Perlu dilakukan penelitian lanjutan terhadap pengaruh ukuran partikel tepung yang digunakan pada pembuatan *cookies gluten free*, sehingga tidak menghasilkan tekstur *sandy* (berpasir), dan perlu dilakukan pengujian rheologi adonan tepung labu kuning dengan tepung sorgum yang dihasilkan

DAFTAR PUSTAKA

Departemen Perindustrian RI. 1990. ***Crackers* dan *Cookies***. Jakarta.

Diah, D. 2013. **Pengaruh Substitusi Tepung Biji Ketapang (*Terminalia Cattapa L*) Terhadap Kualitas *Cookies***. Skripsi. Jurusan Teknik Jasa Produksi, Fakultas Teknik, Universitas Negeri Semarang : tidak diterbitkan.

Gaines, C. S. 1994. ***Objective Assessment of Cookie and Cracker Texture*.** Chapman and Hall : New York

Handayani, D. 1998. **Mempelajari Pengaruh Substitusi Tepung Terigu dengan Tepung Kacang Koro dan Lama Pemanggangan Terhadap Mutu Biskuit**. Tugas Akhir FT UNPAS Bandung : tidak diterbitkan.

Hendrasty, H. K. 2003. **Tepung Labu Kuning : Pembuatan dan Pemanfaatannya**. Kanisius : Yogyakarta.

Kamsiati, E. 2010. **Peluang Pengembangan Teknologi Pengolahan Keripik Buah dengan Menggunakan Penggorengan Vakum**. Jurnal Penelitian dan Pengembangan Pertanian Vol 29 (2) : 73 – 77.

Mariyani, N. 2012. **Studi Pembuatan Mie Kering Berbahan Baku Tepung Singkong dan Mocaf (*Modified Cassava Flour*)**. Jurnal Sains Terapan.

Matz, S. A. 1978. ***Cookies and Crackers Technology***. The AVI Publishing Company Inc :

Russel, R. M. 2006. ***The Multifunctional Carotenoids : Insight Into Their Behaviour***. Journal of Nutrition. Vol 136 : 690 - 692

Santoso, E. B., Basito., Rahadian, D. 2013. **Pengaruh Penambahan Berbagai Jenis dan Konsentrasi Susu Terhadap Sifat Sensoris dan Sifat Fisikokimia Puree Labu Kuning (*Curcubita moschata*)**. Jurnal Teknosains Pangan Vol. 2 No. 3 Juli 2013 : Universitas Sebelas Maret.

Sari, I. D. 2009. **Nutrisi pada Pasien Autis.** Cermin Dunia Kedokteran, 89 – 93.

Sari, S. C. 2016. **Perbandingan Tepung Sorgum, Tepung Sukun, dengan Kacang Tanah dan Jenis Gula Terhadap Karakteristik *Snack Bar***. Tugas Akhir FT UNPAS Bandung : Tidak diterbitkan.

Schoberetal, T. J., Bean, S. R., dan Boyle, D. L. 2007. ***Gluten – Free Sorghum Bread Improved by Sourdough Fermentation : Biochemical, Rheological, and Microstructural Background***. Journal Agriculture Food Chemistry Vol 55 : 5137 – 5146.

See, E. F., Nadiah, W. A. W., dan Aziah, A. A. N. 2017. ***Physico – Chemical and Sensory Evaluation of Breads Supplemented with Pumpkin Flour***. ASEAN Food Journal Vol 14 (2) : 123 – 130.

Siller, A. D. P. 2006. ***In Vitro Digestibility and Estimated Glycemic Index of Sorghum Products***. Tesis Food Science and Technology : Texas A & M University.

Soekarto, S. 1985**. Penilaian Organoleptik untuk Industri Pangan dan Hasil Pertanian**. Bhratara Karya Aksara : Jakarta.

Suarni, R., Patong. 2002. **Tepung Sorgum Sebagai Bahan Substitusi Terigu**. Jurnal Penelitian Pertanian Vol 21 (1) : 43-47.

Suarni. 2004. **Pemanfaatan Tepung Sorgum untuk Produk Olahan**. Jurnal Litbang Pertanian : Makassar.

Sudarto, Y. 1993. **Budidaya Waluh**. Kanisius : Yogyakarta.

Widyastuti, A. D. 2015. **Pengaruh Substitusi Tepung Labu Kuning (*Curcubita moschata*) Terhadap Kadar β – Karoten dan Daya Terima pada Biskuit Labu Kuning**. Skripsi. Fakultas Ilmu Kesehatan Universitas Muhammadiyah Surakarta : tidak diterbitkan

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Artikel pada Konferensi Internasional PATPI 2019 - BANDUNG

The Effect of Pumpkin with Sorghum Flour Ratio on Characteristic of Cookies Gluten Free

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Abstract. Pumpkin and sorghum flour ratio on the characteristics of gluten-free cookies was carried out. The treatment design consisted of a comparison of pumpkin flour with sorghum p1 (3: 1), p2 (2: 1), p3 (1: 1), p4 (1: 2), p5 (1: 3), and p0 as control. The results of the preliminary study showed that the mixing time for 8 hours obtained a spread ratio of 56.85% and a yield of 92.14%. The main results of the study showed that the ratio of pumpkin flour with sorghum flour had an effect on the chemical response (water content, ash content) and organoleptic response (color, aroma, taste, and texture). Based on the results of chemical analysis and organoleptic, the treatment was p5 (the ratio of pumpkin flour with 1: 3 sorghum flour) had tannin content of 0.26%, crude fiber content of 11%, and beta-carotene content of 0.44 ppm.

Keywords: Cookies, Pumpkin Flour, Sorghum Flour, Cookies Gluten Free.

1. Introduction

Cookies are one type of biscuit made from soft, crispy dough and when broken the cross section looks less dense (BSN, 2011). Flour is the main ingredient in making cookies. Wheat flour has a protein (gluten) content which can form a sticky and elastic mass when moistened with water. Gluten is a mixture of two groups or types of wheat protein, namely glutenin and gliadin. Gluten is a substance that is only found in wheat flour while other types of flour do not exist. Some foods that are mostly made from wheat flour are sweet bread, cereals, pasta, cakes, and biscuits (Wulandari, 2010). But the use of flour in making biscuits has an impact on children with autism, because gluten cannot be completely digested. The combination of amino acids in gluten cannot be broken down into single amino acids by the digestive system of children with autistic disorders, but still in the form of peptides.

One alternative to autism in order to consume cookies is to use pumpkin flour and sorghum flour. Pumpkin has a fairly complete nutritional content such as carbohydrates, proteins and vitamins, so it can increase nutritional value. In addition, pumpkin has a yellow color pigment from carotenoids. Carotene has functional properties as antioxidants which protect cells and tissues from damage caused by free radicals in the body. Another ingredient that can be added is sorghum flour. Sorghum has a high nutritional value with a starch content of 72%, 12% protein, and 4% lipids (Susilowati, 2010). However, what needs to be considered is sorghum which is contained in it. Therefore to improve the taste and nutritional value of sorghum, it is necessary to try to reduce the tannin content as low as possible. Based on the things above, it is necessary to study the use of pumpkin flour and sorghum flour which are applied to cookies.
The purpose of this study is to determine the comparison between pumpkin flour and sorghum flour on the characteristics of cookies.

2. Materials and Methods

Raw materials. Pumpkin and Sorghum Flour from Gede Bage Market were used.
Chemicals. H_2SO_4 0,3 N, NaOH 0,3 N, NaCl, $KMnO_4$ 0,01 N, kaolin, indigo, gelatin, and aquadest were used for analysis.

Methods
Sample preparation. Pumpkin flour was produced from pumpkin through the steps process of cutting, trimming, washing, blanching, slicing, drying, grinding and sieving, while sorghum flour was produced from sorghum through steps process of drying, grinding and sieving.

Determination of mixing time. The Mixing time conducted for determination of a well mixing time were 4, 8 and 12 min. The spread ratio and yield of cookies was to determine the expected mixing time.

Flour blending and cookies production. The Pumpkin flour and sorghum flour were blended at various proportions of p1(3:1); p2(2:1); p3(1:1); p4(1:2); p5(1:3) and p0(control). The pumpkin and sorghum flour blends, sugar, baking powder, shortening, egg yolk and maizena were mixed well in a rubber bow to a creamy consistency. The dough was rolled out on a rolling pin and the desired shapes was given to the cut out dough. The cookies was baked, allowed to cool and packaged well.

Sensory evaluation. 30 panelists made up of males and females were selected from the department of Food Technology of Engineering Faculty of Pasundan University . The panelists were educated and requested to evaluate the various cookies samples for colour, texture, flavor, taste, and general acceptability using a 6-point Hedonic scale where 6 was equivalent to like extremely and 1 meant dislike extremely as described by Ihekoronye and Ngoddy (1985). The samples were presented in a packaged material, coded with different random alphabets. It was served simultaneously to ease possibility of panelist evaluating the sample. Necessary precautions were taken to prevent bias of panelist. They were given a sachet of water to rinse their mouth after each stage of sensory evaluation and by ensuring that the panelists were ignorant of the actual sample represented by a code. The sensory evaluation data were analyzed using analysis of variance (ANOVA) as described by Iwe (2002).

Chemical analysis. The samples were analysis on moisture content, ash content, tannin, crude fiber (AOAC, 2010) and betacaroten by using HPLC (modified from N.L. Hanifah et al, 2013). The chemical analysis data were analyzed using analysis of variance (ANOVA).

3. Results and discussion

Moisture and Beta-caroten content of Pumpkin flour

Table 1. Moisture and beta-caroten contens of pumpkin flour

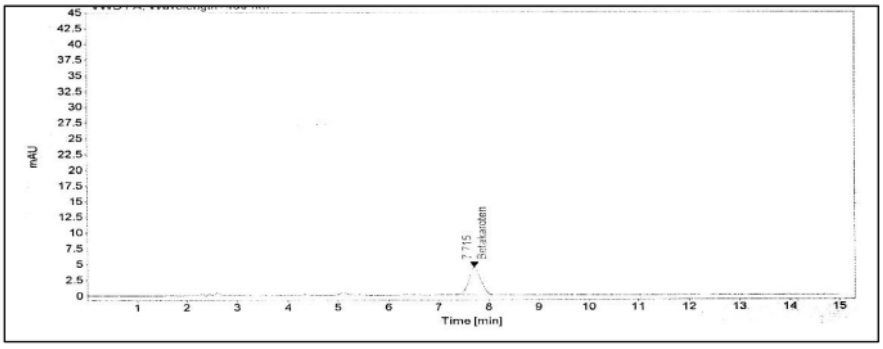
Component	Amount
Moisture content[(1)]	8,5 %
Beta-caroten[(2)]	2,23 ppm

[(1)]Analysis method (AOAC, 2010)
[(2)]HPLC analysis (modified analysis from N L Hanifah et al, 2013)

Table 1. shows the moisture content contained in pumpkin flour was 8.5%. See et.al.'s (2007) the moisture content of pumpkin flour of 10.96% ± 0.12%. Pongjanta et.al., (2006), (6.01% ± 1.47%), El-Demery (2011), (10.64%), and Bhat et.al., (2013), (6.01%). The results indicates that the difference in moisture content can occur due to internal and external factors. An internal factor that might occur is the difference in age of pumpkin used. Because the older pumpkin, the higher the moisture content contained in the fruit. External factors that affect the length of drying, drying temperature, and type of drying equipment used so that the moisture content produced by pumpkin flour is lower than the results of See et al., (2007).

Based on the results of the analysis of beta-carotene using the HPLC method from the raw material of pumpkin flour, beta-carotene content were 2.23 ppm or 0.223 mg/100 grams. The results of the chromatogram of beta-carotene levels in pumpkin flour can be seen in Figure 1. Bhat et al. (2013), pumpkin flour has a beta-carotene content of 7.30 mg / 100 gram, whereas in a study conducted by Pongjanta et.al., (2006) pumpkin flour has a beta-carotene content of 7 , 29 ± 3.82 mg / 100 grams. The results of the analysis of beta-carotene carried out had a lower content compared to the two literature. Factors that can affect the levels of beta-carotene from pumpkin flour are varieties, drying temperatures, and the level of maturity.

Figure 1. Chomatogram of Beta-caroten by using HPLC



Tabel 2. Moisture and tannin contents of Sorghum flour

Components	Amount
Moisture Content[(1)]	6,5 %
Tannin[(2)]	0,52 %

[(1), (2)] Analysis method (AOAC, 2010)

Moisture and tannin contents represented in Table 2. Moisture content in sorghum flour was 6.5% This result indicates that sorghum flour has a low moisture content. Suarni (2004) in the research, sorghum flour has a moisture content of 11.02%, whereas according to Sari (2016) sorghum flour has a moisture content of 10.37%. The results of the analysis of moisture content have had a lower content compared to others research. The result indicates that moisture content affected of the proces i.e. drying time and temperature.
The result of tannin content in sorghum flour was 0.52%. This result indicates that sorghum flour has a high tannin content. Watson (1984) stated that sorghum flour has tannin levels of 0.003 - 0.17%. The results of the analysis of tannin levels carried out have a higher content than others research. The results indicates that there are some factors to influence the tannin content sorghum flour i.e varieties, ignition, and the process of shading.

Determination of Mixing time

In determining the time of mixing were carried out for 4 min, 8 min and 12 min. To determine a good mixing time, the analysis were carried out is to determine of spread ratio and yield. The results indicated in Table 3.

Table 3. Influence of mixing time on physical characteristic (spread ratio and yield)

Mixing Time	Physical Characteristic	
	Spread Ratio	Yield
4 menit	(50,73 %) 1	(96,58%) 1
8 menit	(56,85 %) **3**	(92,14%) **3**
12 menit	(50,62 %) 1	(96,72%) 1

Moisture content of Cookies

Table 4. Ratio of Pumpkin and sorghum flour on moisture content of cookies gluten free

Ratio of Pumpkin and Sorghum flour	Amount	Significance difference (P< 0.05)
p0 (kontrol/t. terigu)	2,31	a
p1 (3:1)	4,75	b
p2 (2:1)	3,88	ab
p3 (1:1)	3,50	ab
p4 (1:2)	3,50	ab
p5 (1:3)	2,38	a

Mean value with different subscript are significantly different (P<0.05)

The results (Table 4) showed that the more ratio of pumpkin flour, the moisture content in gluten free cookies will increase. While the more the ratio of sorghum flour, the moisture content in gluten free cookies will decrease. The results indicate that pumpkin flour has hygroscopic properties or easily absorbs water because of its high sugar content. Pumpkin carbohydrates are high enough to play a role in making dough. Starch granules will stick to proteins during the formation of the dough. The attachment between starch and protein granules will lead to continuity of the dough. The starch mixture will be able to hold water even though the available water is limited and only partial gelatinization occurs (Hendrasty, 2003). According to Pasha et.al., (2013) an increase in the ratio of pumpkin flour will increase the water absorption capacity of the final product, it will reduce the development of the dough. According to See et al., (2007), this is due to the high absorption capacity of water in pumpkin flour compared to wheat flour which is in accordance with the results of Sunday (1992).

Table 5. Ratio of Pumpkin and sorghum flour on ash content of cookies gluten free

Ratio of Pumpkin and Sorghum flour	Amount	Significance difference (P< 0.05)
p0 (kontrol/t. terigu)	1,25	a
p1 (3:1)	2,50	b
p2 (2:1)	2,25	b
p3 (1:1)	2,25	b
p4 (1:2)	2,00	b
p5 (1:3)	1,75	ab

Mean value with different subscript are significantly different (P<0.05)

The results (Table 5) showed that the more the ratio of pumpkin flour, the higher the ash content of gluten free cookies. While the more the ratio of sorghum flour, the lower the ash content of gluten free cookies. This result is in accordance with the research of Pasha et al. (2013) that increasing the ratio of pumpkin flour will increase the ash content in the final product.
The mineral content in whole sorghum will be reduced after the ignition process is carried out. The process of ignition is the process of removing the outer part of the structure of sorghum seeds. The outer part which is lost partially or completely in the ignition process includes the pericarp layer

which is rich in ash and fiber, the aleurone layer which is rich in ash, protein and fat, and the body part which is rich in protein, ash and fat (Da Silva and Taylor, 2004) So that the sorghum flour that has been banned will have a lower ash content compared to the ash content in pumpkin flour.

Chemical and Sensory evaluation of Gluten Free Cookies

Table 6. Chemical composition and sensory evaluation of gluten free cookies

Code	Chemical Compisition		Sensory Parameters			
	Moisture (%)	**Ash (%)**	**color**	**aroma**	**taste**	**texture**
432 (p0)	**2,31 a**	**1,25 a**	**5,64 c**	**5,19 c**	**5,57 e**	**5,53 d**
245 (p1)	4,75 b	2,50 b	3,65 a	3,79 a	3,80 a	3,78 a
315 (p2)	3,88 ab	2,25 b	3,88 b	4,04 b	4,00 b	4,28 c
930 (p3)	3,50 ab	2,25 b	3,92 b	3,78 a	4,15 c	3,89 b
196 (p4)	3,50 ab	2,00 b	3,90 b	3,89 ab	4,20 cd	3,86 ab
674 (p5)	**2,38 a**	**1,75 ab**	**3,88 b**	**3,89 ab**	**4,33 d**	**4,32 c**

Mean value with different subscript are significantly different (P<0.05)

Based on the data from the statistical analysis of the scoring method on the chemical response and organoleptic response it can be concluded that the selected products in the main study were 432 p0 samples as control and 674 p5 samples with the ratio of pumpkin flour with sorghum flour 1: 3. The best treatment refers to Indonesian National Standard (SNI 2973: 2011) concerning cookies. The selected sample was then subjected to chemical analysis, namely tannin, crude fiber, and beta-carotene.

Table 7. Tannin, Crude fiber and Betacarotene contents in selected gluten free cookies

Treatments	**Analysis**		
	Tannin (%)	**Crude fiber (%)**	**Beta-caroten (ppm)**
p0 (kontrol)	-	9	-
p5 (1:3)	0,26	11	0,44

Based on the results of the analysis of tannin content in selected products was found that gluten free cookies treated p5 with a ratio of pumpkin flour with 1: 3 sorghum flour had tannin levels of 0.26%. The results of the preliminary study showed that sorghum flour had 0.52% tannin content, after being cookies the tannin content decreased to 0.26%. Decreasing tannin levels is caused by tannins having water-soluble properties.

Based on the analysis of crude fiber content in selected products was found that gluten free cookies with p0 treatment as control and p5 with a ratio of pumpkin flour with 1: 3 sorghum flour had crude fiber content of 9% and 11%. The results showed that crude fiber content in treatment p5 with a ratio of pumpkin flour with 1: 3 sorghum flour had higher crude fiber content than treatment p0 as a control. This shows that sorghum flour has a higher fiber content than wheat flour.

Based on the results of the analysis of beta-carotene levels in selected products using the HPLC method, it was found that gluten free cookies treated p5 with a ratio of pumpkin flour with 1: 3

sorghum flour had a beta-carotene content of 0.44 ppm or 0.044 mg / 100 gram. The preliminary results showed that pumpkin flour had a beta-carotene content of 2.33 ppm, after being cookies the beta-carotene level decreased to 0.44 ppm. This indicate because the ratio of pumpkin flour is less than sorghum flour. The amount of beta-carotene in the selected product is influenced by the comparison of pumpkin flour added. The more comparisons of pumpkin flour, beta-carotene levels in cookies will increase.

4. Conclusion

Ratio of pumpkin flour with sorghum flour has an effect on the quality of gluten free cookies including chemical responses, namely water content and ash content and organoleptic responses, namely attributes of color, aroma, taste, and texture.

The results of the main study of selected gluten free cookies based on the average value of statistical analysis of the scoring method on the chemical response and organoleptic response were p5 treatment with a ratio of pumpkin flour with 1: 3 sorghum flour. The treatment has tannin levels of 0.26%, crude fiber content of 11%, and beta-carotene content of 0.44 ppm.

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References

Badan Standardisasi Nasional. 2011. Biskuit. 2973 : 2011. Departemen Perindustrian : Jakarta.

Bhat, M. A., Bhat, A. 2013. Study on Physico - Chemical Characteristics of Pumpkin Blended Cake. Food Processing and Technology 4 (9) : 1 – 4.

Da Silva., Taylor J. R. 2004. Sorghum Bran as a Potential Source of Kafirin. Cereal Chemistry Vol 81 (3) : 322 – 327.

El – Deremy, M. E. 2011. Evaluation of Physico – Chemical Properties of Toast Breads Fortified with Pumpkin (Curcubita moschata) Flour.

Hendrasty, H. K. 2003. Tepung Labu Kuning : Pembuatan dan Pemanfaatannya. Kanisius : Yogyakarta.

Ihekoronye, A.I. and Ngoddy, P.O.(1985). Integrated Food Science and Technology for theTropics. Macmillan Publishers Ltd., pp.180-181,189.

Iwe, M.O. (2002). Handbook of Sensory methods and Analysis. Rojoint Communication Services Ltd., pp51-62

Pasha, I., Qurratul Ain, B. K., Masood, S. B dan Muhammad, S. 2013. Rheological and Functional Properties of Pumpkin Wheat Composite Flour. Pakistan Journal of Food Sciences 23 (2) : 100 – 104.

Pongjanta, J., Naulbunrang, A., Kawngdang, S., Manon, T., dan Thepjaikat, T. 2006. Utilization of Pumpkin Powder in Bakery Products. Songklanakarin Journal of Science and Technology 28 (1) : 71 – 79.

Sari, I. D. 2009. Nutrisi pada Pasien Autis. Cermin Dunia Kedokteran, 89 – 93.

See, E. F., Nadiah, W. A. W., dan Aziah, A. A. N. 2017. Physico – Chemical and Sensory Evaluation of Breads Supplemented with Pumpkin Flour. ASEAN Food Journal Vol 14 (2) : 123 – 130.

Suarni. 2004. Pemanfaatan Tepung Sorgum untuk Produk Olahan. Jurnal Litbang Pertanian : Makassar

Susilowati. 2010. Pengembangan pangan fungsional berbasis polisakarida dari sorghum untuk anti kolesterol. http://www.lipi.go.id/www.cgi. [22 April 2010]

Wulandari, M., Hendarsi. 2010. Pengaruh Penambahan Bekatul Terhadar Kadar Protein dan Sifat Organoleptik Biskuit. Jurnal Pangan dan Gizi. Vol 01. No. 02.

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The effect of pumpkin with sorghum flour ratio on the characteristic of cookies gluten-free

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Abstract. Pumpkin and sorghum flour ratio on the characteristics of gluten-free cookies was carried out. The treatment design consisted of a comparison of pumpkin flour with sorghum p1 (3:1), p2 (2:1), p3 (1:1), p4 (1:2), p5 (1:3), and p0 as control. The results of the preliminary study showed that the mixing time for 8 hours obtained a spread ratio of 56.85% and a yield of 92.14%. The main results of the study showed that the ratio of pumpkin flour with sorghum flour had an effect on the chemical response (water content, ash content) and organoleptic response (color, aroma, taste, and texture). Based on the results of chemical analysis and organoleptic, the treatment was p5 (the ratio of pumpkin flour with 1:3 sorghum flour) had tannin content of 0.26%, crude fiber content of 11%, and beta-carotene content of 0.44 ppm.

Keywords: Cookies, Pumpkin Flour, Sorghum Flour, Cookies Gluten Free

1. Introduction

Cookies are one type of biscuit made from soft, crispy dough and when broken the cross-section looks less dense [1]. Flour is the main ingredient in making cookies. Wheat flour has a protein (gluten) content which can form a sticky and elastic mass when moistened with water. Gluten is a mixture of two groups or types of wheat protein, namely glutenin and gliadin. Gluten is a substance that is only found in wheat flour while other types of flour do not exist. Some foods that are mostly made from wheat flour are sweet bread, cereals, pasta, cakes, and biscuits [2]. But the use of flour in making biscuits has an impact on children with autism because gluten cannot be completely digested. The combination of amino acids in gluten cannot be broken down into single amino acids by the digestive system of children with autistic disorders, but still in the form of peptides.

One alternative to autism in order to consume cookies is to use pumpkin flour and sorghum flour. Pumpkin has a fairly complete nutritional content such as carbohydrates, proteins and vitamins, so it can increase nutritional value. In addition, pumpkin has a yellow color pigment from carotenoids. Carotene has functional properties as antioxidants that protect cells and tissues from damage caused by free radicals in the body. Another ingredient that can be added is sorghum flour. Sorghum has high nutritional value with a starch content of 72%, 12% protein, and 4% lipids [3]. However, what needs to be considered is sorghum which is contained in it. Therefore to improve the taste and nutritional value of sorghum, it is necessary to try to reduce the tannin content as low as possible. Based on the things above, it is necessary to study the use of pumpkin flour and sorghum flour which is applied to cookies. The

purpose of this study is to determine the comparison between pumpkin flour and sorghum flour on the characteristics of cookies.

2. Materials and methods

2.1. Materials

The raw materials were pumpkin and sorghum flour from Gede Bage market. The chemicals used for analysis were H_2SO_4 0.3 N, NaOH 0.3 N, NaCl, $KMnO_4$ 0.01 N, kaolin, indigo, gelatin, and aquadest.

2.2. Methods

2.2.1. Sample preparation. Pumpkin flour was produced from pumpkin through the steps process of cutting, trimming, washing, blanching, slicing, drying, grinding and sieving, while sorghum flour was produced from sorghum through steps process of drying, grinding and sieving.

2.2.2. Determination of mixing time. The Mixing time conducted for determination of a well mixing time was 4, 8 and 12 min. The spread ratio and yield of cookies were to determine the expected mixing time.

2.2.3. Flour blending and cookies production. The Pumpkin flour and sorghum flour were blended at various proportions of p1(3:1); p2(2:1); p3(1:1); p4(1:2); p5(1:3) and p0(control). The pumpkin and sorghum flour blends, sugar, baking powder, shortening, egg yolk and maizena were mixed well in a rubber bow to a creamy consistency. The dough was rolled out on a rolling pin and the desired shapes were given to the cutout dough. The cookies were baked, allowed to cool and packaged well.

2.2.4. Sensory evaluation. A total of 30 panelists made up of males and females were selected from the Department of Food Technology of Engineering Faculty of Pasundan University. The panelists were educated and requested to evaluate the various cookies samples for colour, texture, flavor, taste, and general acceptability using a 6-point Hedonic scale where 6 was equivalent to like extremely and 1 meant dislike extremely as described by Ihekoronye and Ngoddy (1985) [4]. The samples were presented in a packaged material, coded with different random alphabets. It was served simultaneously to ease the possibility of panelists evaluating the sample. Necessary precautions were taken to prevent bias of panelists. They were given a sachet of water to rinse their mouth after each stage of sensory evaluation and by ensuring that the panelists were ignorant of the actual sample represented by a code. The sensory evaluation data were analyzed using analysis of variance (ANOVA) as described by Iwe (2002) [5].

2.2.5. Chemical analysis. The samples were analyzed on moisture content, ash content, tannin, crude fiber [6] and beta carotene by using HPLC (modified from N. L. Hanifah *et al* 2013 [7]). The chemical analysis data were analyzed using analysis of variance (ANOVA).

3. Results and discussions

3.1. Moisture and Beta-carotene content of pumpkin flour

Table 1 shows the moisture content contained in pumpkin flour was 8.5%. See *et al* (2007) the moisture content of pumpkin flour of 10.96% ± 0.12% [8]. Pongjanta *et al* (2006), (6.01% ± 1.47%) [9], El-Demery (2011), (10.64%) [10], and Bhat *et al* (2013), (6.01%) [11]. The results indicate that the difference in moisture content can occur due to internal and external factors. An internal factor that might occur is the difference in the age of pumpkin used. Because of the older pumpkin, the higher the moisture content contained in the fruit. External factors that affect the length of drying, drying

temperature and type of drying equipment used so that the moisture content produced by pumpkin flour is lower than the results of See *et al* (2007) [8].

Table 1. Moisture and beta-carotene contents of pumpkin flour.

Component	Amount
Moisture content	8.5% [6]
Beta-caroten	2.23 ppm [7]

Based on the results of the analysis of beta-carotene using the HPLC method from the raw material of pumpkin flour, beta-carotene content was 2.23 ppm or 0.223 mg/100 grams. The results of the chromatogram of beta-carotene levels in pumpkin flour can be seen in figure 1. A study by Bhat *et al* (2013) [11], pumpkin flour has a beta-carotene content of 7.30 mg / 100 gram, whereas in a study conducted by Pongjanta *et al* (2006) [9] pumpkin flour has a beta-carotene content of 7.29 ± 3.82 mg / 100 grams. The results of the analysis of beta-carotene carried out had a lower content compared to the two literature. Factors that can affect the levels of beta-carotene from pumpkin flour are varieties, drying temperatures, and the level of maturity.

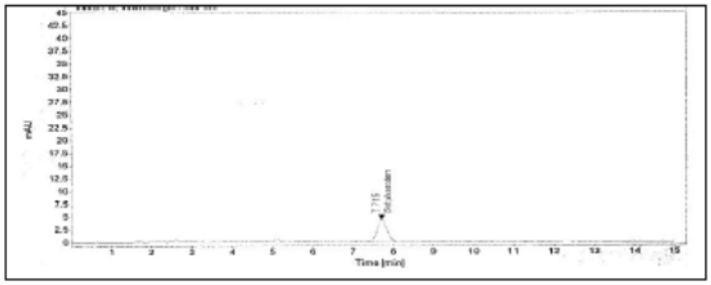

Figure 1. Chomatogram of Beta-carotene by using HPLC.

3.2. Moisture and tannin content of sorghum flour

Moisture and tannin contents represented in table 2. Moisture content in sorghum flour was 6.5%. This result indicates that sorghum flour has a low moisture content. Suarni (2004) in the research, sorghum flour has a moisture content of 11.02% [12], whereas according to Sari (2016) sorghum flour has a moisture content of 10.37% [13]. The results of the analysis of moisture content have had lower content compared to other research. The result indicates that moisture content affected the process i.e. drying time and temperature.

Tabel 2. Moisture and tannin contents of sorghum flour.

Components	Amount
Moisture Content	6.5% [6]
Tannin	0.52% [6]

The result of tannin content in sorghum flour was 0.52%. This result indicates that sorghum flour has a high tannin content. Watson (1984) stated that sorghum flour has tannin levels of 0.003–0.17% [14]. The results of the analysis of tannin levels carried out have a higher content than other research. The results indicate that there are some factors to influence the tannin content sorghum flour i.e varieties, ignition, and the process of shading.

3.3. Determination of mixing time

In determining the time of mixing were carried out for 4 min, 8 min and 12 min. To determine a good mixing time, the analysis was carried out is to determine of spread ratio and yield. The results indicated in table 3.

Table 3. Influence of mixing time on a physical characteristic (spread ratio and yield).

Mixing Time	Physical Characteristic	
	Spread Ratio	Yield
4 minutes	(50.73%) 1	(96.58%) 1
8 minutes	(56.85%) 3	(92.14%) 3
12 minutes	(50.62%) 1	(96.72%) 1

3.4. Moisture content of cookies

The results (table 4) show that the more ratio of pumpkin flour, the moisture content in gluten-free cookies will increase. While the more the ratio of sorghum flour, the moisture content in gluten-free cookies will decrease. The results indicate that pumpkin flour has hygroscopic properties or easily absorbs water because of its high sugar content. Pumpkin carbohydrates are high enough to play a role in making the dough. Starch granules will stick to proteins during the formation of the dough. The attachment between starch and protein granules will lead to continuity of the dough. The starch mixture will be able to hold water even though the available water is limited and only partial gelatinization occurs [15]. According to Pasha *et al* (2013), an increase in the ratio of pumpkin flour will increase the water absorption capacity of the final product [16], thus will reduce the development of the dough. According to See *et al* (2007) [8], this is due to the high absorption capacity of water in pumpkin flour compared to wheat flour which is in accordance with the results of Kurkani and Joshi (2013) [17].

Table 4. The ratio of pumpkin and sorghum flour on the moisture content of cookies gluten-free.

Ratio of Pumpkin and Sorghum flour	Amount (%)	Significance difference ($P < 0.05$)
p0 (control/wheat flour)	2.31	a
p1 (3:1)	4.75	b
p2 (2:1)	3.88	ab
p3 (1:1)	3.50	ab
p4 (1:2)	3.50	ab
p5 (1:3)	2.38	a

Mean value with different subscript are significantly different ($P < 0.05$)

Table 5. The ratio of pumpkin and sorghum flour on ash content of cookies gluten-free.

Ratio of pumpkin and sorghum flour	Amount (%)	Significance difference ($P < 0.05$)
p0 (control/wheat flour)	1.25	a
p1 (3:1)	2.50	b
p2 (2:1)	2.25	b
p3 (1:1)	2.25	b
p4 (1:2)	2.00	b
p5 (1:3)	1.75	ab

Mean value with different subscript are significantly different ($P < 0.05$)

had a beta-carotene content of 0.44 ppm or 0.044 mg / 100 gram. The preliminary results showed that pumpkin flour had a beta-carotene content of 2.33 ppm, after being cookies the beta-carotene level decreased to 0.44 ppm. This indicates because the ratio of pumpkin flour is less than sorghum flour. The amount of beta-carotene in the selected product is influenced by the comparison of pumpkin flour added. The more comparisons of pumpkin flour, beta-carotene levels in cookies will increase.

4. Conclusion

Comparison of pumpkin flour with sorghum flour has an effect on the quality of gluten-free cookies including chemical responses, namely water content and ash content and organoleptic responses, namely attributes of color, aroma, taste, and texture.

The results of the main study of selected gluten-free cookies based on the average value of statistical analysis of the scoring method on the chemical response and organoleptic response were p5 treatment with a ratio of pumpkin flour with 1:3 sorghum flour. The treatment has tannin levels of 0.26%, crude fiber content of 11%, and beta-carotene content of 0.44 ppm.

References

[1] Badan Standardisasi Nasional 2011 *Biskuit 2973:2011* (Jakarta: Departemen Perindustrian)
[2] Wulandari M and Hendarsi 2010 Pengaruh Penambahan Bekatul Terhadar Kadar Protein dan Sifat Organoleptik Biskuit *Jurnal Pangan dan Gizi* **1**(2)
[3] Susilowati 2010 *Pengembangan pangan fungsional berbasis polisakarida dari sorghum untuk anti kolesterol* http://www.lipi.go.id/www.cgi.[22 April 2010]
[4] Ihekoronye A I and Ngoddy P O 1985 *Integrated Food Science and Technology for the Tropics* (London: Macmillan Publishers Ltd) pp 180–1,189
[5] Iwe M O 2002 *Handbook of Sensory methods and Analysis* (Enugu, Nigeria: Rojoint Communication Services Ltd.) pp 51–62
[6] AOAC 2010 Official Methods of Analysis of Association of Official Analytical Chemists. 18th Edition, Washington, DC
[7] N.L. Hanifah *et al* 2013 Validasi Metode Analisis Beta Caroten dengan HPLC MWD pada Matriks Sample Minyak Sawit *Prosiding Seminar Tahunan MAKSI* Penguatan, Penelitian dan Pengembangan Industri Kelapa Sawit yang berkelanjutan. pp. 179–188
[8] See E F, Nadiah W A W and Aziah A A N 2007 Physico–Chemical and Sensory Evaluation of Breads Supplemented with Pumpkin Flour *ASEAN Food Journal* **14**(2) 123–30
[9] Pongjanta J, Naulbunrang A, Kawngdang S, Manon T and Thepjaikat T 2006 Utilization of Pumpkin Powder in Bakery Products *Songklanakarin Journal of Science and Technology* **28**(1) 71–9
[10] El–Deremy M E 2011 Evaluation of Physico–Chemical Properties of Toast Breads Fortified with Pumpkin (Curcubita moschata) Flour *The 6th Arab and 3rd Int. Annu. Scientif. Conf.* 1–17
[11] Bhat M A and Bhat A 2013 Study on Physico-Chemical Characteristics of Pumpkin Blended Cake *Food Processing and Technology* **4**(9) 1–4
[12] Suarni 2004 Pemanfaatan Tepung Sorgum untuk Produk Olahan. *Jurnal Litbang Pertanian Makassar* (Makassar)
[13] Sari I D 2009 *Nutrisi pada Pasien Autis Cermin Dunia Kedokteran* 89–93
[14] Watson S A 1984 Corn and Sorghum Starches. Production. Pages 417–486 in : Starch Chemistry and Technology. R L Whistler E.H. Pashchall and J.N. BeMiller,eds Academic Press, Orlando FL
[15] Hendrasty H K 2003 Tepung Labu Kuning Pembuatan dan Pemanfaatannya (Yogyakarta Kanisius)
[16] Pasha I, Qurratul Ain B K, Masood S B and Muhammad S 2013 Rheological and Functional Properties of Pumpkin Wheat Composite Flour *Pakistan Journal of Food Sciences* **23**(2) 100–4

[17] Kurkarni A.S. and Joshi D.C 2013 Effect of replacement of wheat flour with pumpkin powder on textural and sensory qualities of biscuit, *International Food Research Journal,* (20) 2. pp. 587-591

[18] Da Silva and Taylor J R 2004 Sorghum Bran as a Potential Source of Kafirin. *Cereal Chem.* 81(3) 322–7

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