The Qualityof Spent Hen Chicken Sausagewith TomatoPasteatDifferentRefrigeratedStorage Time

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ABSTRACT

Aims: This research aims to determine the quality of spent hen chicken sausage with thetomato paste at different refrigerated storage time based on pH, color, moisture content,totalmicroorganism, and rancidity

Studydesign: Thisresearchareanlaboratoryexperimentalwithacompletelyrandomizeddesign.

Place and Duration of Study: This research are located in Laboratory of Animal ProductTechnology, Faculty of Animal Science, Universityof Brawijaya.

Methodology: This research are using a 4 treatments and 5 replications. The main focusare a different storage time for spent hen chicken sausage on refrigerator (4˚C). The 4treatmentsare 0day(D_0), 7days (D_1), 14 days (D_2), and21 days(D_3)

Results: The different storage time on spent hen sausage with tomato paste gave a verysignificant effect ($P < .01$) on pH, color analysis (L a*b*), moisture content, totalmicroorganism, and rancidity. pH, moisture content, total microorganism, and rancidity areincreased during storage time meanwhile for color analysis are decreased during storagetime.

Conclusion: Except for being a natural food colorant, tomato can be used for naturalantioxidant. The addition of tomato paste on spent hen sausage can extend spent hensausage's shelf life until 21 days on refrigerated temperature (4˚C). The further researchare needed for consumer safety on spent hen chicken sausage with the addition of tomatopaste.

Keywords:spenthenmeat,sausage,tomatopaste,restructuredmeat,storagetime

1.INTRODUCTION

Indonesiaisalargecountrywiththepopulationof278,26millionpeople.Foodarealways beenanissuedforpublic.Themostpopular proteinfoodinIndonesiaisaneggandchicken meat.Beafarenotsopopularbecauseit'smoreexpensivethanchickenmeat.Thechicken meatconsumptioninIndonesiaareonly0,158kg/capitaandmostofthemarefrombroiler meat[1].Spenthenchickenareachickenthatalreadyhavealoweggproductivitybecause oftheiroldage.Spenthenchickenpotentiallycanbeusedtoincreasetheconsumptionof chickeninIndonesiabecausespenthenchickenhasahighnutritionsuchas59.8%moisture content,18.5%ofprotein,14.9%offat,and5.3%ofmineral[2].Publicdidn'tliketoconsume spenthenmeatbecauseithasanexcessivetextureandeasiertogetrancid.Thesolutionthat

canimprovethequalityofspenthenchickensothepublicwillacceptitareusingarestructured meattechnology.

Restructuredmeattechnologyareatechnologythatcanimprovethequalityofameat.The exampleofrestructuredmeatarechickensausage.Meat that has been used for sausage are chicken, beef, or fish. Rarely of sausage production using a spent hen meat. In Indonesia, Spent hen meat only used on Indonesian dish namely soto ayam, similar as chicken soup so it need an new innovation that can increase the value of spent hen meat. Sausageareafoodthatallagesofpeopleliketoconsumebutsometimestheyaskforasafetystatement.Inmarketplace,sausagetendtohaveanitiicasantioxidantsoithasalongershelflifebuttheexcessiveuseofnitriccancauseanillnesssuchascancer[3]Thedemandofsafetyfoodfrom publicarerisingsotheusedofsyntheticantioxidantneedstobereduced.Anaturalantioxidantcanbeusedasasyntheticsubstitute.Moreoverit'seasiertogetandmorehealthy.Tomatoaretheexampleofnatural antioxidant.

Tomato(*Solanumlycopersicum*)areaholticultureproductthatcanbeusedforafoodcolorantandantioxidant.Tomatohasacarotenoid,phenoliccompounds,vitaminsC,andEsoitcanpotentiallyused asnaturalantioxidantinfoodproductssuchassausage[4].Theuseoftomatoalreadyknowninpublic.QiuandChin[5]statesthattheuseoftomatopowdercanexpandsausageshelftimebecauseithassomenaturalantioxidantthatcandestroysomefreeradicals.ThesimillarreportareChoi[6]statesthat tomatoarearichantioxidantcomponentsthatcanextendshelflifeofmeat,tomatocanbeusedasantimicrobaandreduceameatpathogensuchas*C.pefringens*.Thisstudyaimstoknowthequalityofspenthensausagewiththeadditionof tomatopasteatdifferentrefrigeratedstoragetime.

2.MATERIALAND METHODS

2.1Materials

Thematerialusedonthisresearcharespenthensausagewiththeadditionof15%tomato paste.Theingredientsformakingspenthensausagearespenthen meat(60g),tomatopaste (15g),garlic(3g),tapioca(6g),canolaoil(10g),skimmilkpowder(5g),icecube(10g),and seasoningingredientssuchassalt(2g),sugar(2g),pepper(0.5g),gingerpowder(0.25g), nutmegpowder(0.25g),andmushroompowder(1g).Foranalysisaredistiledwater,buffer4 and7,peptone,PCA(*PlateCountAgar*),aceticacid,chloroform,potassiumiodide,and sodiumthiosulphate.

2.2Methods

ThisresearchusingalaboratoryexperimentalwithCRD(CompletelyRandomizeDesign)4 treatmentsand5replications.The4treatmentsareadifferentstoragetimewhich0day(D0), 7days(D1),14days(D2),and21days(D3).Thestoragetemperaturewas4˚C(refrigerated).

2.3DataAnalysis

ThecollecteddataaretabulatedusingMicrosoftExcel2013andfurtheranalysisusing ANOVAmethods.DuncanMultipleRangeTest (DMRT)areusewhenthere'sasignificantor verysignificanteffectondata.

2.4SpentHenSausageProduction

Dicethespenthenmeatthatalreadyremovedfromskin,fat,andbone.Putthedicedmeat intomeatgrinder,andgrindthemeatwithadditionofsaltandicecube.Addtheother ingredientslikegarlic,tapioca,canolaoil,skimmilkpowder,sugar,pepper,gingerpowder, nutmegpowder,andmushroompowder.Alsoaddthe15goftomatopaste.Grindagainuntil homogenandfine.Putthesausagebatterintoselulosecasingusingasausagestuffer.Boiled thesausagefor20minutesin80˚Cwater.Puttheboiledsausageintocoldwaterfor10 minutes.Storethecookedspenthensausageon4˚Crefrigerator.Spenthensausageare readyforfurtheranalyzed.

2.4 QualityofSpentHenSausage

2.4.1pHValue

pH wasdeterminedusingapHmeter.5gsamplewascrushwithmortarandpestlethenput itonpotfilm.Dilutedthesamplewith10gdistiledwater.BeforeusingapH meter,pH meter mustcalibratedusingastandardbuffersolution(bufferpH7and4).PutthepHmeter electrodeintobuffersolution7then4.After itsteady,putthepHmeterelectrodeintodiluted sample,waitfor 5 minutes.pHvaluescanbeseenonscreen.

2.4.2ColorAnalysis

Colorwasdeterminedusingacolorreader.Beforeanalysingsamplewithcolorreader,color readermustcalibratedusingblackandwhiteplate.Cutthesampleabout2 cmx2 cmx2 cm andthenplaceitona tray.Placecolorreaderlenseontopof the sampleand click thepower button.Colorvaluescanbeseenonscreenwith3typesofcolorwhicharedness, yellowness,andlightness.

2.4.3MoistureContent

Moisturecontentwasdeterminedusinggravimetricmethod.Weighedthepetridishwithout sample(A).Weighed2gofsausagesample,putonthepetridishthathasbeenonthe105°C ovenfor12hoursandweighedit(B).Drythesamplefor12hours,thenplaceditondesiccator for10minutesbeforeweighedit(C).Thefinalweightcanbecalculatedusingthemoisture contentformulation=

$$moisture\ content\ (\%) = \frac{(B-C)}{100\%(B-A)} x$$

2.4.4TotalMicroorganism

Totalmicroorganismwasdeterminedusingtotalplatecount(TPC)methods.Calculationfor totalmicroorganismusingapour plate methodwiththerangeofcolonies25– 250.

2.4.5 Rancidity

Totalranciditywasdeterminedusingperoxidevalue.Prepare10gram ofsamplethenputit onErlenmeyer,add30mLofaceticacidandchloroform(3:2).Add0,5mLofpotassium iodideandadd30mLofdistiledwater.Titratethesampleusingsodiumthiosulphateand peroxidevalue canbecalculatedusingformulation=

$$Peroxdievalue\left(\frac{meq}{kg}\right) = \frac{titrationvolumexnormalityofsodium\ thiosulphate}{sampleweight} x100$$

3.RESULTSANDDISCUSSION

3.1 pHValue

pHvaluesofdifferentstoragetimespenthensausagewiththeadditionoftomatopasteare presentedinTable1.VerysignificanteffectareshowninpH(*P*<.01).pHvaluesincreased duringstoragetimeuntil21days.ThelowestpHareon0daysstoragetimewith6.40andthe highestareon21daysstoragetimewith6.64.AnincreaseofpHarerelatedtoanincreaseof totalmicroorganism.Thelongerstoragetime,microorganismtendtogrowsothepH increased.Thisisbecausemetabolitesofmicroorganismonmeatandcausedaprotein deamination[7].ThehigherpHvaluealsocanincreasefatoxidationthatcancausearancidity[8].

Sangkeunetal.[9]reportthattheadditionofsappanextractonporksausageasnatural antioxidantcanincreasepHwithincreasedstoragetime.TheincreaseofpHvaluearemainly becauseofmicroorganism.Similarresearchwerereportby Talukderetal.[10]thatthe additionofblackplumextractonchickenpattiesincreasesignificantly(*P*=.05)whenbeing store for 3days.Metabolitesofmicroorganismcanbea reasonfor pHvaluetoincrease.

3.2ColorAnalysis

Coloranalysis(La*b*)ofdifferentstoragetimespenthensausagewiththeadditionoftomato pastearepresentedinTable1.Verysignificanteffectareshowninlightness(L),Redness (a*),andYellowness(b*)(*P*<.01).Lightness,redness,andyellownessdecreeasedduring storagetimeuntil21days.Tomatopastecangaveareddishcoloronspenthensausage becausetomatocontainanaturalfoodcolorantnamelylycopeneandb-carotene.Lycopene andb-carotenearesensitiveintooxygen,light,andheat[11].Storagetimecandecrease lightness(L),redness(a*),andyellowness(b*)mainlybecauseoffatoxidation.Unsaturated fattyacidcancausedaoxidationwhenitreactedtooxygen.Whenunsaturatedfattyacidreact tooxygen,itmadeanewcompoundsknownashidroperoxidethatcancausedanoffodor andoffcolor [12].

QiuandChin[5]reportthattheadditionoftomatopowderonbeefpattiescandecreasethe colorwhenitstoredfor14days.Redpigmentontomato,lycopene,aredecreasedbecause ofoxidation.Anotherstudywerereportby Hwangetal.[13]thatthecoloroffrankfurterwith additionofbeetrootextractasnaturalfoodcolorantandantioxidantdecreasefrom15.48to 14.83.Betalainspigmentonbeetrootalsosensitivetooxygensoit'spossibletodecrease whenfatoxidationoccurs.

3.3MoistureContent

Moisturecontentofdifferentstoragetimespenthensausagewiththeadditionoftomatopaste arepresentedinTable1.Verysignificanteffectareshowninmoisturecontent(*P*<.01). Moisturecontentincreasedduringstoragetimeuntil21days.Thelowestmoisturecontentare on0daysstoragetimewith50.62%andthehighestareon21daysstoragetimewith57.15%. IndonesianNationalStandard(SNI)statethatthemaximum ofmoisturecontentonsausage are67%,sausagewiththeadditionoftomatopastestillonstandardrangewith50.62%–146 57.15%.

Moisturecontentarerelatedtoshelflife.Thehighermoisturecontent,theeasier microorganismtogrowth.Moisturecontentareincreasedbecauseofthemetabolitesof microorganism.Microorganismcaneffectonpectindegradation[14].Pectinaretomatofiber thatcanbindwater.Whenpectinlosetheabilitytobindwater,meatproductusuallyhavea highmoisturecontentandcancausedalowtexture[15].

3.4TotalMicroorganism

Totalmicroorganismofdifferentstoragetimespenthensausagewiththeadditionoftomato *154* pastearepresentedinTable1.Verysignificanteffectareshownintotalmicroorganism(*P*< .01).Totalmicroorganismslightlyincreasedduring storagetimeuntil21days.Thelowestare on 0days storage time with0.08 x10^3CFU/gand thehighest are on 21 days with0.14x10^3 CFU/g.IndonesianNationalStandard(SNI)statedthatthemaximumoftotalmicroorganism onsausageare1x10^5.sausagewiththeadditionoftomato paste stillonstandardrange.

Microorganismarecorrelatedwithmoisturecontentandp H.Thehighermoisturecontent, microorganismtendtogrowfaster[16].Microorganismareanimportantfactoronmeat product'sshelflife.Highmicroorganismcanreducethequalityandshelflifeoftheproduct. Theadditionoftomatopastecanslowerthegrowthofmicroorganismbecausetomatocontain anaturalantioxidantwhichiscarotenoid,ascorbicacid,andphenoliccompounds[17].

Theadditionofnaturalantioxidantcanslowdownthegrowthofmicroorganism.Jeeyeonet al.[18]reportthatascorbicacidfrom lemoncanslowdown*C.perfringens*onsausage.The otherstudyareadditionofeggplantpowderonporksausage.Additionofeggplantpowderon sausagecanminimalizemicroorganismmetabolicbecauseeggplanthasanaturalantioxidant namely phenolic and ascorbic acid

[19].

3.5Rancidity

Rancidityofdifferentstoragetimespenthensausagewiththeadditionoftomatopasteare presentedinTable1.Verysignificanteffectareshowninperoxidevalue(*P*<.01).Peroxide valueslightlyincreasedduringstoragetimeuntil21days.Thelowestareon0daysstorage timewith0.71meq/kgandthehighestareon21dayswith1.12meq/kg.Jinkyuetal.[20] reportthestandardofperoxidevalueinmeatproductthatcanstillacceptablebyconsumer areunder25meq/kg.

Whenperoxidevalueexcessthestandard,itcancauseanoffodor,offflavor,andoffcolor. Fatandoxygenarethemainfactoroftheperoxidevalueincreased.Unsaturatedfattyacid aresensitiveintooxygen,light,andtemperature.Whenunsaturatedfattyacidmeetoxygenit canleadaformationofhydroperoxide(ketonesandaldehydes)andleadtofatoxidation[21]. Toslowdownthefatoxidation,antioxidantareneeded.Theuseoftomatoonspenthen sausagecanslowdownthefatoxidationbecauseithasanaturalantioxidant.Carotenoid, ascorbicacid,andphenoliccompoundscandestroyfreeradicalsthatcancausedanoxidation [17].Joukietal.[22]reportthattheadditionoftomatopasteonfrankfurtersausageslightly increaseuntil 14daysofrefrigeratedstoragetime.Tomatopastecanminimalizeanoxidative reactionfromfatbecauseofantioxidantproperties.

Table1. Qualityof SpentHenSausagewithDifferent StorageTime

Variable	Treatments			
	D_0±SD	**D_1±SD**	**D_2±SD**	**D_3±SD**
pH	6.40±0.04[a]	6.54±0.02[b]	6.59±0.02[b]	6.64±0.04[c]
Lightness(L)	67.10±0.05[b]	66.98±0.06[b]	66.82±0.05[a]	66.38±0.52[a]
Redness(a*)	3.28±0.12[c]	3.07±0.04[c]	2.94±0.06[b]	2.71±0.07[a]
Yellowness(b*)	22.42±0.02[c]	22.35±0.04[c]	23.23±0.05[b]	22.13±0.06[a]
Moisture content(%)	50.62±0.36[a]	53.21±0.91[b]	54.78±0.35[c]	57.15±0.84[d]
TotalMicroorganism (CFU/g)	0.08±0.70[a]	0.1±0,44[a]	0.13±0.32[b]	0.14±0.21[b]
Peroxide Value(meq/kg)	0.71±0.14[a]	0.84±0.15[a]	1.02±0.08[b]	1.12±0.07[b]

a,b,c,dshowsaverysignificanteffect

4.CONCLUSION

Tomato paste are potentially being used for natural antioxidant. Addition of 15g tomato paste on spent hen sausage can extend spent hen sausage's shelf life until 21 days on refrigerated temperature (4˚C) based on pH, color analysis, moisture content, total microorganism, and peroxide value. Different storage time can gave a very significant effect on each variable. The further research are needed about the safety of spent hen chicken sausage with the addition of tomato paste after being stored for 21 days.

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